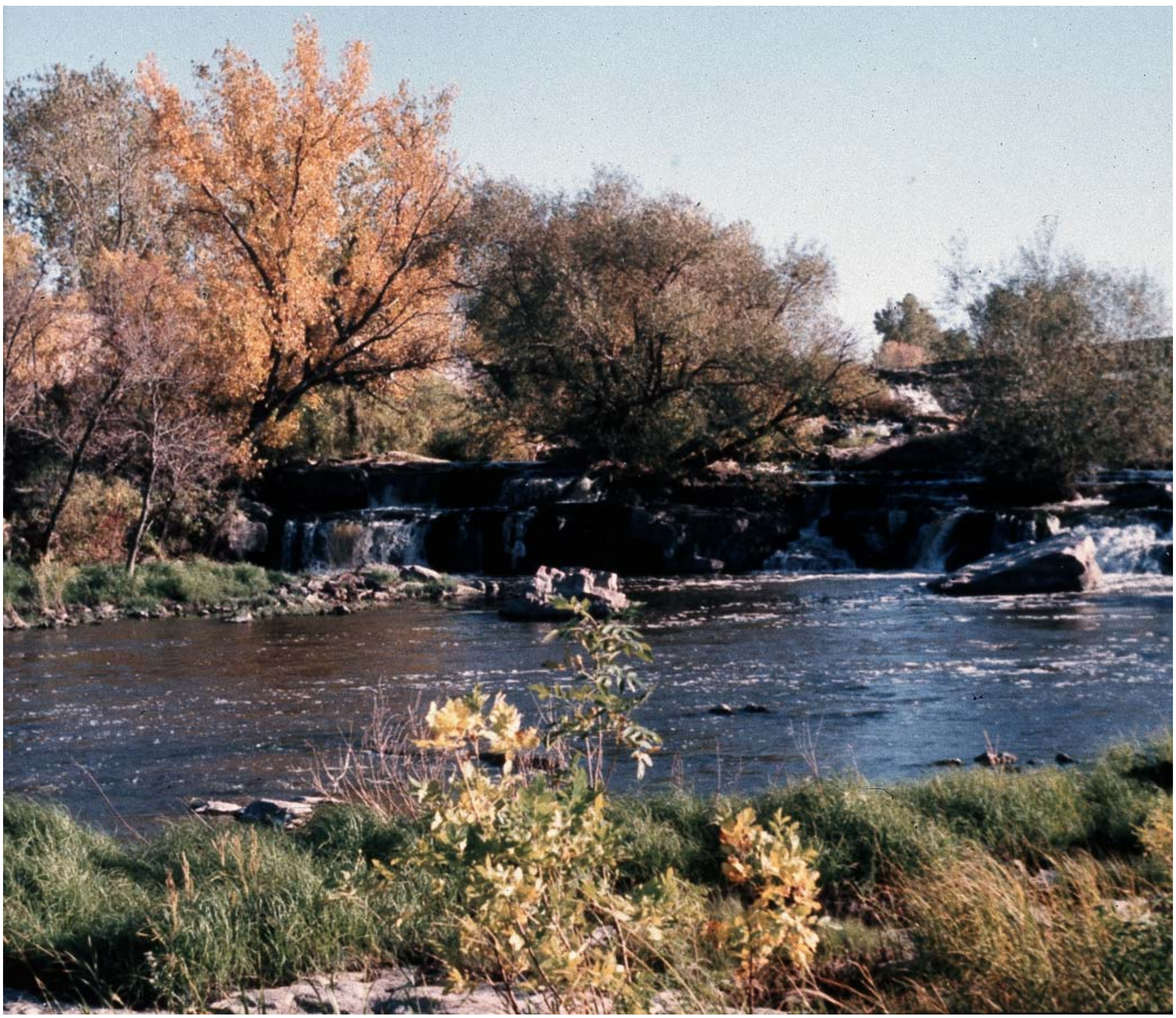
United States Department of Agriculture

Natural Resources Conservation Service

In cooperation with South Dakota Agricultural Experiment Station at South Dakota State University

Soil Survey of Minnehaha County, South Dakota



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How To Use This Soil Survey

General Soil Map

The general soil map, which is a color map, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

To find information about your area of interest, locate that area on the map, identify the name of the map unit in the area on the color-coded map legend, then refer to the section **General Soil Map Units** for a general description of the soils in your area.

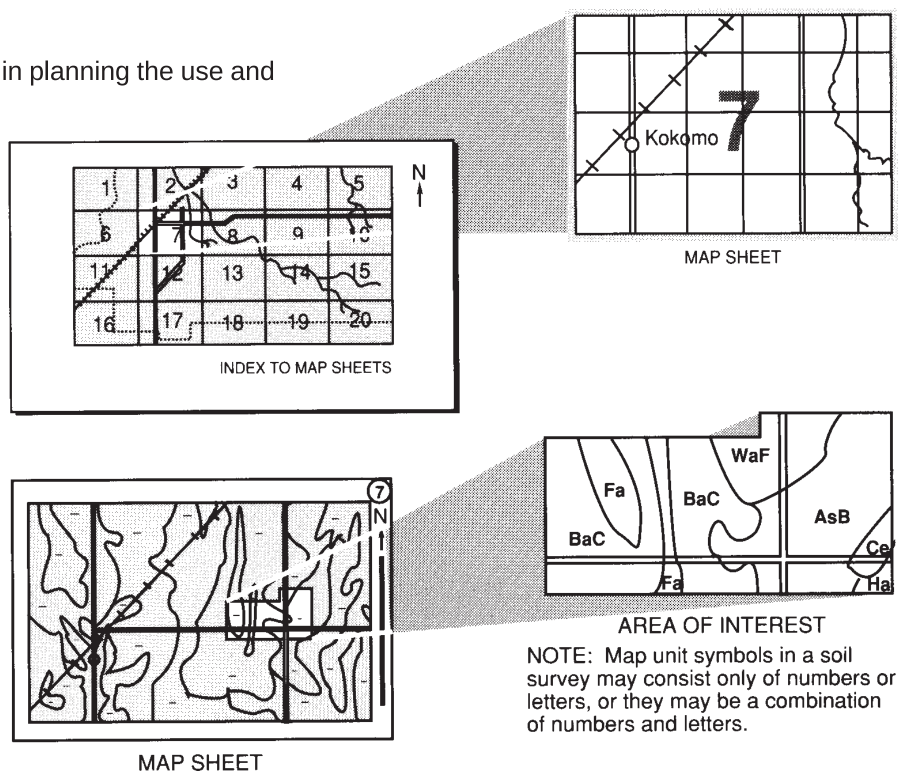
Detailed Soil Maps

The detailed soil maps can be useful in planning the use and management of small areas.

To find information about your area of interest, locate that area on the **Index to Map Sheets**. Note the number of the map sheet and turn to that sheet.

Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. Turn to the **Contents**, which lists the map units by symbol and name and shows the page where each map unit is described.

The **Contents** shows which table has data on a specific land use for each detailed soil map unit. Also see the **Contents** for sections of this publication that may address your specific needs.



NOTE: Map unit symbols in a soil survey may consist only of numbers or letters, or they may be a combination of numbers and letters.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (formerly the Soil Conservation Service) has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1994. Soil names and descriptions were approved in 1995. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1995. This survey was made cooperatively by the Natural Resources Conservation Service and the South Dakota Agricultural Experiment Station at South Dakota State University. The survey is part of the technical assistance furnished to the Minnehaha County Conservation District. Financial assistance was furnished by the East Dakota Water Development District, Minnehaha County, and the City of Sioux Falls.

Cover: An area of Ihlen-Rock outcrop complex, 4 to 35 percent slopes, along the Big Sioux River at Sioux Falls.

Additional information about the Nation's natural resources is available on the Natural Resources Conservation Service homepage on the World Wide Web. The address is http://www.nrcs.usda.gov.

Contents

Issued 2004

Foreword

This soil survey contains information that affects land use planning in this survey area. It contains predictions of soil behavior for selected land uses. The survey also highlights soil limitations, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, ranchers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. The information in this report is intended to identify soil properties that are used in making various land use or land treatment decisions. Statements made in this report are intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described, and information on specific uses is given. Help in using this publication and additional information are available at the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

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Soil Survey of Minnehaha County, South Dakota

By Eugene E. Preston, Natural Resources Conservation Service

Fieldwork by Eugene E. Preston, Regis L. Vialle, and Daniel J. Brady, Natural Resources Conservation Service, and Peter L. Smith, Timothy R. Overdier, and Dean L. Stoneman, private contractors

United States Department of Agriculture, Natural Resources Conservation Service, in cooperation with the South Dakota Agricultural Experiment Station at South Dakota State University

MINNEHAHA COUNTY is in southeastern South Dakota (fig. 1). It borders Minnesota on the east and Iowa on the southeast. It has a total land area of 520,627 acres.

This soil survey updates the survey of Minnehaha County published in 1964 (Nestrud and others, 1964). It provides additional information and has new maps, which show the soils in greater detail.

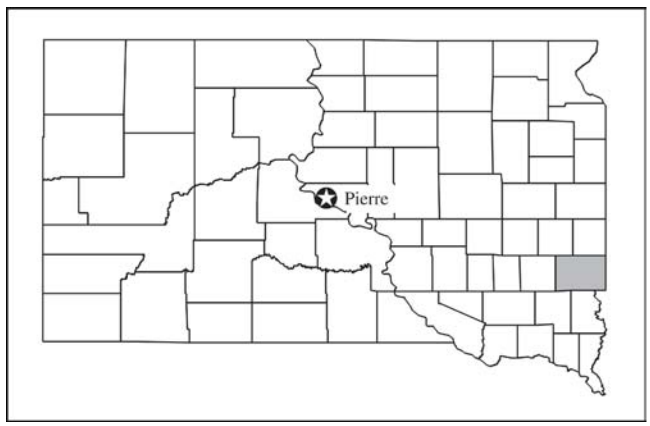

Figure 1.—Location of Minnehaha County in South Dakota.

General Nature of the County

This section provides general information about Minnehaha County. It describes climate; physiography, relief, and drainage; settlement; farming; and natural resources.

Climate

Table 1 gives data on temperature and precipitation for the survey area as recorded at Sioux Falls, South Dakota, in the period 1971 to 2000. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter, the average temperature is 18 degrees F and the average daily minimum temperature is 9 degrees. The lowest temperature on record, which occurred on January 19, 1970, was -36 degrees F. In summer, the average temperature is 71 degrees F. The highest recorded temperature, which occurred on June 21, 1988, is 110 degrees F.

Growing degree days are shown in table 1. They are equivalent to “heat units.” During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F for small grain; 50 degrees F for row crops). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is about 25 inches. Of this, 18 inches, or 72 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 9 inches. The heaviest 1-day rainfall during the period of record was 4.59 inches on August 1, 1975.

Thunderstorms occur on about 44 days each year, and most occur in July.

The average seasonal snowfall is about 40 inches. The greatest snow depth at any one time during the period of record was 36 inches. On the average, 77 days of the year have at least 1 inch of snow on the ground. The number of such days varies greatly from year to year. The heaviest 24-hour snowfall on record, which occurred at Sioux Falls on February 17 and 18, 1962, was 26 inches. The total accumulation from that storm, which lasted 3 days, was 32 inches.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 81 percent. The sun shines 75 percent of the time possible in summer and 57 percent in winter. The prevailing wind is from the south, except during the winter, when it is from the northwest. Average windspeed is highest, 12 miles per hour, in May.

Tornadoes and severe thunderstorms strike occasionally. These storms are local and of short duration and can result in severe damage in narrow belts. Hailstorms occur at times during the warmer part of the year in irregular patterns and in relatively small areas.

Physiography, Relief, and Drainage

Minnehaha County is at the extreme southern edge of the Coteau des Prairies section of the Central Lowland Province (Rothrock, 1943). Elevation ranges from approximately 1,820 feet in the northwest corner of the county to about 1,250 feet on the southeastern border.

The Big Sioux River and its tributaries drain most of the county. In the eastern two-thirds of the county, the drainage is dendritic and stream dissection generally is well developed. In the western third of the county, the drainage pattern is more poorly defined and closed depressions are numerous.

Pre-Cambrian Sioux quartzite underlies the county and crops out in several areas (Tomhave, 1994; Flint, 1955). The entire county has been glaciated; however, in roughly the eastern two-thirds of the county, the glacial till is covered in most places by loess.

Settlement

For several thousand years prior to recorded history, Native tribes inhabited the area. Native villages and campsites were particularly numerous along the Big Sioux River. Paleo-Indians are believed to be the first people in the area. About 500 A.D., the area became inhabited by a culture often referred to as The Mound Builders. These people combined hunting and gathering with agriculture, raising corn, beans, and squash. About 1500 A.D., agrarian peoples of the Mandan-Arikara group moved into the area. These people were eventually replaced by the nomadic Dakota (Sioux) Indians (Schell, 1975).

In 1683, a French fur trader named Le Sueur explored along the Big Sioux River as far south as the Sioux Falls area. Later, Dr. Joseph Nicollet traveled in this vicinity and wrote a description of the falls of the Big Sioux River. In 1857, two separate non-Native settlements were established in the area of the Sioux Falls. In 1858, a sod fort was built for protection (Bailey, 1899).

In 1862, the Santee Sioux, who were starving because they had been denied the provisions promised them by treaty, revolted, and several white settlers in Minnesota were killed. Two were killed at Sioux Falls. Settlers in Sioux Falls became fearful and abandoned the settlement until 1865, when an army post was established there. In 1868, Scandinavian families settled near Baltic and Dell Rapids. The first railroad entered the county in 1878 (Bailey, 1899; Kolbe, 1988).

The population of the county has increased steadily. In 1900, the population was 23,926; by 1960, it had increased to 86,575. The 1990 census showed a population of 123,809. In 1990, the population in the part of Sioux Falls that is in Minnehaha County was 99,405. Sioux Falls is the county seat and is by far the largest city in the county and in the State of South Dakota. The population of Brandon was 3,543 in 1990. Dell Rapids had a population of 2,484. Other municipalities are Baltic (population 666), Colton (population 657), Crooks (population 671), Garretson (population 924), Hartford (population 1,262), Humboldt (population 468), Sherman (population 66), and Valley Springs (population 739) (U.S. Department of Commerce, 1993).

The county is served by two major interstate highways and several State highways. Roads are on almost every section line. Most roads have a gravel or asphalt surface.

There are several railroads for the movement of freight. Several airlines serve the county from the regional airport in Sioux Falls.

Farming

Farming is one of the major enterprises of Minnehaha County. About 58 percent of the farm income is derived from the sale of livestock and livestock products (U.S. Department of Commerce, 1999). About 1,112 acres of cropland is irrigated

(South Dakota Agricultural Statistics Service, 1995). In 1997, the 1,125 farms in the county averaged 361 acres in size (U.S. Department of Commerce, 1999). The trend is toward fewer and larger farms.

About 75 percent of the county is used for cultivated crops or for tame pasture and hay (U.S. Department of Commerce, 1999), and about 2.5 percent is rangeland (USDA, 1992). Most of the rest of the county is urban or residential land.

The Minnehaha County Conservation District was organized in 1941 to provide assistance to landowners and others interested in the conservation of soil and water. Since then, its purposes and concerns have expanded to include conservation of all natural resources.

Natural Resources

Soil is the most important natural resource in Minnehaha County. It provides a growing medium for crops and for the grasses grazed by livestock. Other natural resources are water, sand and gravel, and Sioux quartzite.

The main sources of water for domestic uses and for livestock are shallow wells drilled to a depth of about 15 to 200 feet. Excavated ponds in areas of Arlo, Baltic, Clamo, Chancellor, Obert, Salmo, and Worthing soils provide additional water for livestock and wildlife. The Big Sioux Aquifer provides sufficient water of adequate quality for irrigation.

Significant deposits of sand and gravel are in areas of the Arlo, Dimo, Delmont, Dempster, Enet, Graceville, and Talmo soils. Because of an excessive amount of fine rock fragments, such as chalk, shale, and clay ironstone, most of the sand and gravel is unsuitable as concrete aggregate or as construction material. It is suitable, however, as subgrade material for roads and as bituminous aggregate.

Sioux quartzite has been quarried in parts of the county since the earliest days of European settlement. Formerly used for building construction, most of the rock is now used for concrete aggregate, railroad ballast, road construction and sanding, rip-rap for dams and riverbank stabilization, and production of ferro-silicon for the steel industry. The quartzite is nearest the surface in areas of Ihlen soils.

How This Survey Was Made

This survey was made to provide information about the soils and miscellaneous areas in the survey area. The information includes a description of the soils and miscellaneous areas and their location and a discussion of their suitability, limitations, and management for specified uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

The soils and miscellaneous areas in the survey area are in an orderly and repeatable pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how the soils formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationships, are sufficient to verify predictions of the kinds of soil in an area and to determine the soil map unit boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they

could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same or similar kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not as predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific soil map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

The descriptions, names, and delineations of the soils on the soil maps in this survey area do not fully agree with those on the maps of the published soil surveys of Lake, Lincoln, McCook, Moody, and Turner Counties in South Dakota; Lyon County, Iowa; and Rock County, Minnesota. Differences are the result of a better knowledge of soils, modifications in series concepts, or variations in the intensity of mapping or in the extent of the soils in the survey areas.

Some of the soil maps in this survey include areas that were not mapped using the methods described in the previous paragraphs. These are areas where access to the land was denied. The soil maps of these areas were made using available remote sensing materials. Reduced reliability of the soil map can be expected in areas where access was denied. The locations of these areas are as follows:

E½NW¼ section 24, T. 103 N., R. 51 W.
S½SE¼ section 15, T. 103 N., R. 51 W.
W½NW¼ section 22, T. 103 N., R. 51 W.
NW¼ section 21, T. 103 N., R. 51 W.
W½ section 19, T. 101 N., R. 52 W.
SE¼ section 33, T. 104 N., R. 48 W.
N½NW¼ section 8, T. 103 N., R. 51 W.
NE¼ section 25, T. 104 N., R. 52 W.
NW¼ section 4, T. 103 N., R. 51 W.
NW¼ section 18, T. 104 N., R. 51 W.
SE¼ section 32, T. 104 N., R. 51 W.
N½NW¼ section 9, T. 103 N., R. 51 W.
SE¼ section 31, T. 104 N., R. 51 W.
NE¼ section 5, T. 103 N., R. 51 W.
N½SW¼ section 5, T. 103 N., R. 51 W. (the portion west of the ditch)
N½SE¼ section 5, T. 103 N., R. 51 W. (the portion west of the ditch)
SE¼SW¼ section 5, T. 103 N., R. 51 W.
SW¼SE¼ section 5, T. 103 N., R. 51 W. (the portion west of the ditch)
W½SE¼SE¼ section 5, T. 103 N., R. 51 W. (the portion west of the ditch)

General Soil Map Units

The general soil map in this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. These broad areas are called associations. Each association on the general soil map is a unique natural landscape. Typically, it consists of one or more major soils or miscellaneous areas and some minor soils or miscellaneous areas. It is named for the major soils or miscellaneous areas. The components of one association can occur in another but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one association differ from place to place in slope, depth, drainage, and other characteristics that affect management.

The soils in the associations are in different landform positions (fig. 2). These landform positions affect such characteristics as the amount of topsoil, the drainage class, the runoff rate, and the content of organic matter.

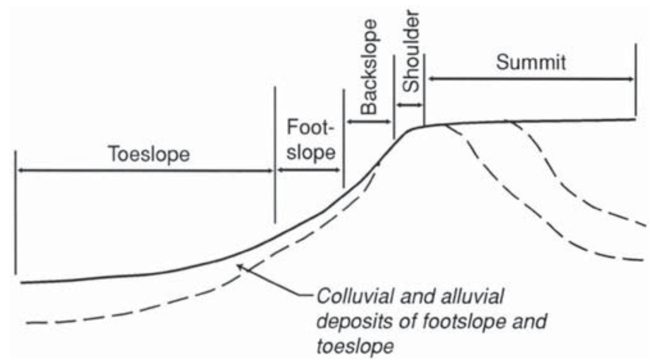

Figure 2.—Landform positions.

Nearly Level to Strongly Sloping, Silty and Loamy Soils on Till Plains and Moraines

These soils formed in silty material over loamy glacial till and in loamy glacial till. They make up about 33 percent of the county. Most areas are used for cultivated crops. The steeper areas are used for pastureland, hayland, or rangeland. Controlling water erosion and conserving moisture are important management concerns if the major soils are cropped. Proper grazing management is an important concern in areas of pasture and rangeland.

1. Egan-Ethan-Trent Association

Well drained and moderately well drained, nearly level to strongly sloping, loamy and silty soils on till plains and moraines (fig. 3)

Composition

Extent of the association in the survey area: 27 percent
Extent of the soils in the association:
Egan and similar soils—30 percent
Ethan and similar soils—23 percent
Trent and similar soils—14 percent
Soils of minor extent—33 percent

Setting

Landform: Till plains and moraines
Position on the landform: Egan—summits and backslopes; Ethan—shoulders and backslopes; Trent—footslopes
Slope range: Egan—0 to 9 percent; Ethan—2 to 15 percent; Trent—0 to 2 percent
Texture of the surface layer: Egan—silty clay loam; Ethan—loam; Trent—silty clay loam

Soil Properties and Qualities

Drainage class: Egan—well drained; Ethan—well drained; Trent—moderately well drained
Depth to bedrock: Very deep

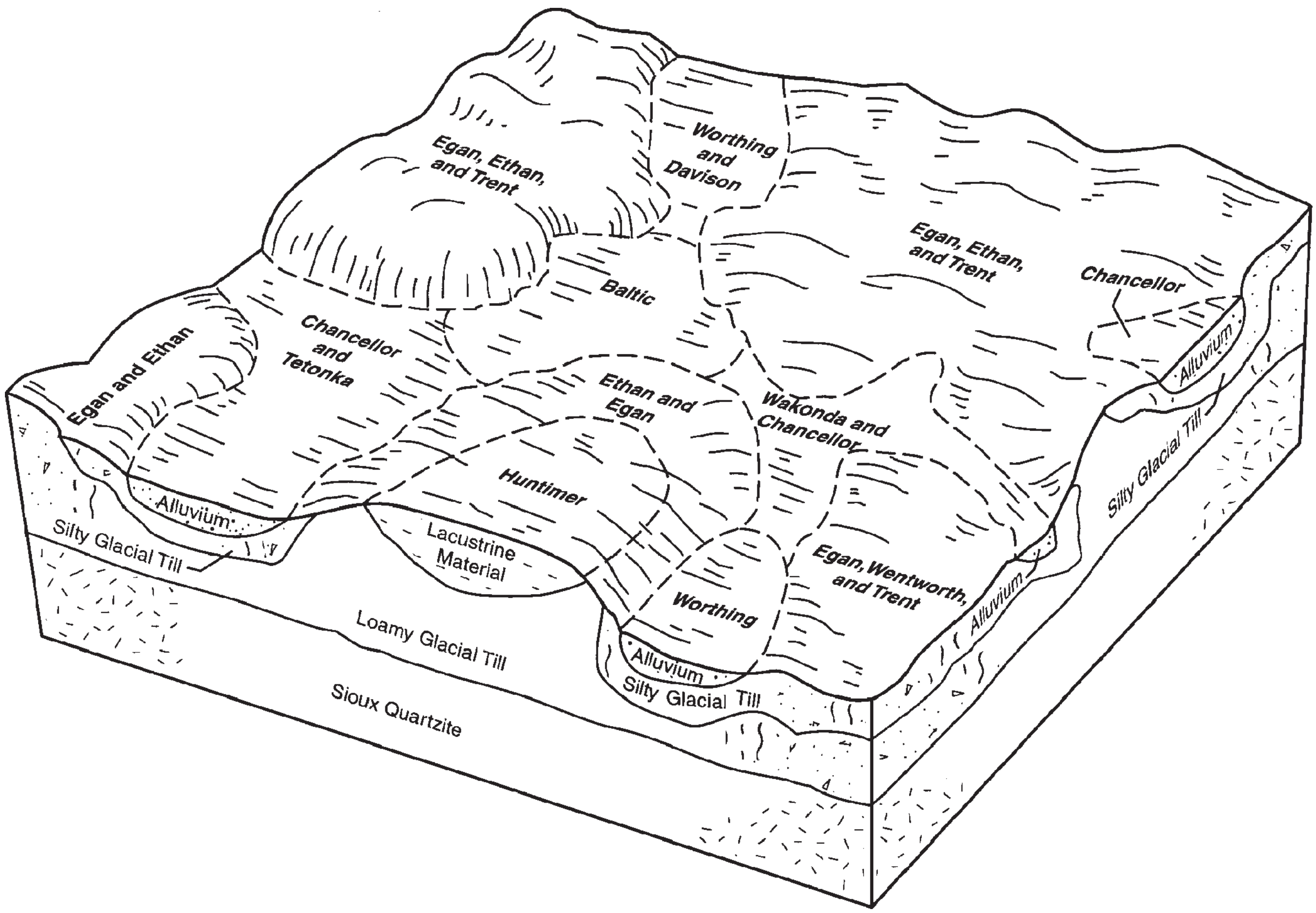

Figure 3.—Typical pattern of soils and parent material in the Egan-Ethan-Trent association.

Depth to contrasting layer: Egan—24 to 40 inches over loamy glacial till; Ethan—more than 60 inches; Trent—more than 40 inches over loamy glacial till
Depth to the water table: Egan—more than 6 feet; Ethan—more than 6 feet; Trent—3.5 to 5.0 feet
Flooding: None
Ponding: None
Permeability: Egan—moderately slow; Ethan—moderately slow; Trent—moderate
Available water capacity: High
Content of organic matter: Egan—moderate; Ethan—moderately low; Trent—high
Surface runoff class: Egan—low or medium; Ethan—medium or high; Trent—low

Soils of Minor Extent

• The very poorly drained Baltic soils, which are calcareous throughout; in large basins
• The somewhat poorly drained Chancellor soils on toeslopes
• The moderately well drained, calcareous Davison soils on backslopes and footslopes
• The well drained Huntimer soils, which formed in glaciolacustrine sediments and are on summits and backslopes
• The poorly drained Tetonka soils in basins
• The very poorly drained Worthing soils, which do not have carbonates above a depth of 35 inches; in basins

Use and Management

Major land use: Cropland
Other land uses: Pasture and hay; range
Main crops: Corn, soybeans, alfalfa, and small grain
Suitability for crops: The Egan and Trent soils are well suited to cultivated crops and to tame pasture and hay. The Ethan soils are fairly well suited to cultivated crops and to tame pasture and hay.
Management considerations: Conserving moisture and controlling water erosion are the main concerns in areas of the Egan and Ethan soils. Controlling wind erosion is an additional concern in areas of the Ethan soils. The high content of lime in the Ethan soils adversely affects the availability of plant nutrients.

2. Egan-Wentworth-Trent Association

Well drained and moderately well drained, nearly level to moderately sloping, silty soils on till plains

Composition

Extent of the association in the survey area: 6 percent
Extent of the soils in the association:
Egan and similar soils—23 percent
Wentworth and similar soils—23 percent
Trent and similar soils—17 percent
Soils of minor extent—37 percent

Setting

Landform: Till plains
Position on the landform: Egan—summits and backslopes; Wentworth—backslopes; Trent—footslopes
Slope range: Egan—0 to 9 percent; Wentworth—0 to 6 percent; Trent—0 to 2 percent
Texture of the surface layer: Silty clay loam

Soil Properties and Qualities

Drainage class: Egan—well drained; Wentworth—well drained; Trent—moderately well drained
Depth to bedrock: Very deep
Depth to contrasting layer: Egan—24 to 40 inches over loamy glacial till; Wentworth and Trent—more than 40 inches over loamy glacial till
Depth to the water table: Egan—more than 6 feet; Wentworth—more than 6 feet; Trent—3.5 to 5.0 feet
Flooding: None
Ponding: None
Permeability: Egan—moderately slow; Wentworth—moderate; Trent—moderate
Available water capacity: High
Content of organic matter: Egan—moderate; Wentworth—moderate; Trent—high
Surface runoff class: Egan—low or medium; Wentworth—low or medium; Trent—low

Soils of Minor Extent

- The somewhat poorly drained Chancellor soils on toeslopes
- The well drained, calcareous, loamy Ethan soils, which formed in glacial till; on shoulders
- The moderately well drained, calcareous Wakonda soils, which formed in silty sediments; on footslopes
- The very poorly drained Worthing soils in basins

Use and Management

Major land use: Cropland
Other land uses: Pasture and hay; range
Main crops: Corn, soybeans, alfalfa, and small grain
Suitability for crops: The soils in this association are well suited to cultivated crops and to tame pasture and hay.
Management considerations: Controlling water erosion and conserving moisture are the main management concerns.

Nearly Level to Very Steep, Silty and Loamy Soils on Plains, Dissected Plains, Till Plains, and Moraines

These soils formed in loess, loamy and sandy eolian material, and loamy glacial till. They make up about 53 percent of the county. Most areas are used for cultivated crops. The steeper areas are used as pastureland, hayland, or rangeland. Controlling wind erosion and water erosion and conserving moisture are the most important management concerns if the major soils are cropped. The high content of lime adversely affects the availability of plant nutrients in areas of the Crofton soils. Proper grazing management is an important concern in areas of pasture and rangeland.

3. Moody-Trent Association

Well drained and moderately well drained, nearly level to moderately sloping, silty soils on plains

Composition

Extent of the association in the survey area: 7 percent
Extent of the soils in the association:
Moody and similar soils—62 percent
Trent and similar soils—16 percent
Soils of minor extent—22 percent

Setting

Landform: Plains
Position on the landform: Moody—summits and backslopes; Trent—footslopes
Slope range: Moody—0 to 9 percent; Trent—0 to 2 percent
Texture of the surface layer: Silty clay loam

Soil Properties and Qualities

Drainage class: Moody—well drained; Trent—moderately well drained
Depth to bedrock: Very deep
Depth to contrasting layer: Moody—more than 40 inches over loamy glacial till or sandy material; Trent—more than 40 inches over loamy glacial till

Depth to the water table: Moody—more than 6 feet; Trent—3.5 to 5.0 feet
Flooding: None
Ponding: None
Permeability: Moderate
Available water capacity: High
Content of organic matter: Moody—moderate; Trent—high
Surface runoff class: Moody—low or medium; Trent—low

Soils of Minor Extent

- The somewhat poorly drained Chancellor soils on toeslopes
- The very poorly drained Obert soils on low flood plains
- The moderately well drained, calcareous Wakonda soils on footslopes adjacent to basins
- The somewhat poorly drained Whitewood soils, which formed in alluvium; on toeslopes

Use and Management

Major land use: Cropland
Other land uses: Pasture and hay; range
Main crops: Corn, soybeans, and alfalfa
Suitability for crops: The soils in this association are well suited to cultivated crops and to tame pasture and hay.
Management considerations: Controlling water erosion and conserving moisture are the main management concerns.

4. Moody-Nora Association

Well drained, nearly level to moderately steep, silty soils on plains and dissected plains (fig. 4)

Composition

Extent of the association in the survey area: 11 percent
Extent of the soils in the association:
Moody and similar soils—38 percent
Nora and similar soils—32 percent
Soils of minor extent—30 percent

Setting

Landform: Plains and dissected plains
Position on the landform: Moody—summits and backslopes; Nora—summits, shoulders, and backslopes
Slope range: Moody—0 to 9 percent; Nora—2 to 25 percent
Texture of the surface layer: Silty clay loam

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting layer: More than 40 inches over loamy glacial till or sandy material
Depth to the water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderate
Available water capacity: High
Content of organic matter: Moderate
Surface runoff class: Moody—low or medium; Nora—medium or high

Soils of Minor Extent

- The well drained, calcareous Crofton soils, which formed in loess; on shoulders
- The very poorly drained Obert soils on low flood plains
- The moderately well drained Trent soils on footslopes
- The somewhat poorly drained Whitewood soils, which formed in alluvium; on toeslopes

Use and Management

Major land use: Cropland
Other land uses: Pasture and hay; range
Main crops: Corn, soybeans, and alfalfa
Suitability for crops: The Moody soils are well suited to cultivated crops and to tame pasture and hay. The Nora soils are fairly well suited to cultivated crops and to tame pasture and hay in areas where slopes are less than 15 percent.
Management considerations: Controlling water erosion and conserving moisture are the main management concerns.

5. Nora-Crofton Association

Well drained, gently sloping to moderately steep, silty soils on plains and dissected plains

Composition

Extent of the association in the survey area: 23 percent
Extent of the soils in the association:
Nora and similar soils—52 percent
Crofton and similar soils—22 percent
Soils of minor extent—26 percent

Setting

Landform: Plains and dissected plains
Position on the landform: Nora—summits, shoulders, and backslopes; Crofton—shoulders

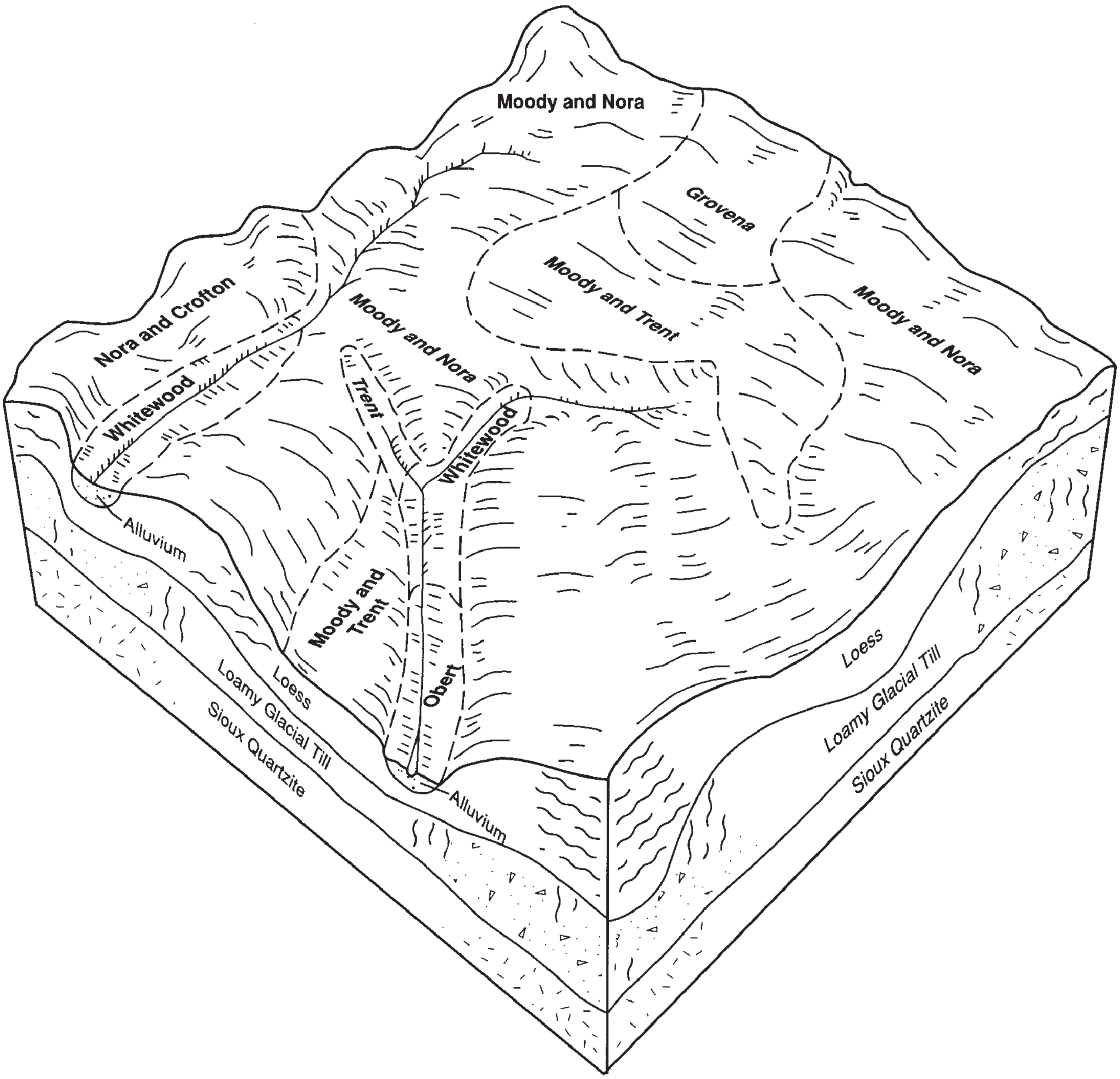

Figure 4.—Typical pattern of soils and parent material in the Moody-Nora association.

Slope range: Nora—2 to 25 percent; Crofton—6 to 25 percent
Texture of the surface layer: Nora—silty clay loam; Crofton—silt loam

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting layer: Nora—more than 40 inches over loamy glacial till or sandy material; Crofton—more than 60 inches
Depth to the water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderate
Available water capacity: High
Content of organic matter: Nora—moderate; Crofton—low
Surface runoff class: Medium or high

Soils of Minor Extent

- The somewhat poorly drained, calcareous

Lamo soils on low flood plains along the smaller creeks
• The very poorly drained Obert soils on low flood plains
• The moderately well drained Trent soils on footslopes
• The somewhat poorly drained Whitewood soils, which formed in alluvium; on toeslopes

Use and Management

Major land use: Cropland
Other land uses: Pasture and hay; range
Main crops: Corn, soybeans, and alfalfa
Suitability for crops: The Nora soils are fairly well suited to cultivated crops and to tame pasture and hay in areas where slopes are less than 15 percent. The Crofton soils are poorly suited to cultivated crops and to tame pasture and hay.
Management considerations: Controlling water erosion and conserving moisture are the main management concerns. In areas of the Crofton soils, wind erosion is an additional concern and the high content of lime adversely affects the availability of plant nutrients.

6. Splitrock-Trent Association

Well drained and moderately well drained, nearly level to gently sloping, silty soils on till plains

Composition

Extent of the association in the survey area: 1 percent
Extent of the soils in the association:
Splitrock and similar soils—72 percent
Trent and similar soils—13 percent
Soils of minor extent—15 percent

Setting

Landform: Till plains
Position on the landform: Splitrock—summits and backslopes; Trent—footslopes
Slope range: Splitrock—0 to 6 percent; Trent—0 to 2 percent
Texture of the surface layer: Silty clay loam

Soil Properties and Qualities

Drainage class: Splitrock—well drained; Trent—moderately well drained
Depth to bedrock: Very deep
Depth to contrasting layer: Splitrock—24 to 40 inches over loamy glacial till; Trent—more than 40 inches over loamy glacial till
Depth to the water table: Splitrock—more than 6 feet; Trent—3.5 to 5.0 feet
Flooding: None
Ponding: None
Permeability: Splitrock—moderately slow; Trent—moderate
Available water capacity: High
Content of organic matter: Splitrock—moderate; Trent—high
Surface runoff class: Splitrock—low or medium; Trent—low

Soils of Minor Extent

• The somewhat poorly drained Chancellor soils on toeslopes
• The well drained Flandreau soils, which formed in loamy material over sandy material; on backslopes
• The somewhat poorly drained Lamo soils on low flood plains along the smaller creeks
• The very poorly drained Obert soils on low flood plains
• The somewhat excessively drained Thurman soils on shoulders
• The moderately well drained, calcareous Wakonda soils on footslopes
• The somewhat poorly drained Whitewood soils, which formed in alluvium; on toeslopes

Use and Management

Major land use: Cropland
Other land uses: Pasture and hay; range
Main crops: Corn, soybeans, and alfalfa
Suitability for crops: The soils in this association are well suited to cultivated crops and to tame pasture and hay.
Management considerations: Controlling water erosion and conserving moisture are the main management concerns.

7. Houdek-Shindler Association

Well drained, gently undulating to moderately steep, loamy soils on till plains and moraines

Composition

Extent of the association in the survey area: 1 percent
Extent of the soils in the association:
Houdek and similar soils—32 percent
Shindler and similar soils—24 percent
Soils of minor extent—44 percent

Setting

Landform: Till plains and moraines
Position on the landform: Houdek—backslopes; Shindler—shoulders

Slope range: Houdek—2 to 25 percent; Shindler—6 to 25 percent
Texture of the surface layer: Clay loam

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting layer: More than 60 inches
Depth to the water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Content of organic matter: Houdek—moderate; Shindler—moderately low
Surface runoff class: Houdek—medium or high; Shindler—high or very high

Soils of Minor Extent

- The somewhat poorly drained Chaska soils on low flood plains
- The well drained, calcareous Crofton soils, which formed in loess; in the higher positions on the landscape
- The well drained and moderately well drained Davis soils on footslopes on fans and on high flood plains
- The well drained, silty Nora soils, which formed in loess; in positions on some upper side slopes above those of the Houdek soils
- The well drained Splitrock soils, which formed in 20 to 40 inches of silty material over loamy glacial till; on backslopes
- The well drained Steinauer soils, which have a thinner surface layer than that of the Houdek soils; on shoulders
- The excessively drained Talmo soils in positions on shoulders above those of the Shindler soils
- The somewhat excessively drained Thurman soils, which formed in sandy material; on shoulders

Use and Management

Major land use: Rangeland
Other land use: Pasture
Suitability for crops: The Houdek soils are fairly well suited to cultivated crops and to tame pasture and hay in areas where slopes are less than 15 percent. The Shindler soils are generally unsuited to cultivated crops. In small areas where slopes are less than 15 percent, the Shindler soils are fairly well suited to cultivated crops and to tame pasture and hay.
Management considerations: Controlling water erosion and conserving moisture are the main management concerns.

8. Shindler-Steinauer Association

Well drained, strongly sloping to very steep, loamy soils on moraines

Composition

Extent of the association in the survey area: 1 percent
Extent of the soils in the association:
Shindler and similar soils—31 percent
Steinauer and similar soils—27 percent
Soils of minor extent—42 percent

Setting

Landform: Moraines
Position on the landform: Shindler—backslopes; Steinauer—shoulders
Slope range: Shindler—9 to 40 percent; Steinauer—25 to 60 percent
Texture of the surface layer: Clay loam

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting layer: More than 60 inches
Depth to the water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Content of organic matter: Shindler—moderately low; Steinauer—low
Surface runoff class: Shindler—high or very high; Steinauer—very high

Soils of Minor Extent

- The well drained, calcareous Crofton soils, which formed in loess; in the higher positions on the landscape
- The well drained Davis soils on footslopes on fans
- The somewhat poorly drained, calcareous Lamo soils on low flood plains
- The well drained, silty Moody soils, which formed in loess; in positions on some small nearly level to gently sloping backslopes above those of the Shindler soils
- The excessively drained Talmo soils in positions on shoulders above those of the Steinauer soils
- The moderately well drained Trent soils, which formed in loess over glacial till; on footslopes
- The well drained Houdek soils, which have a thicker surface layer than that of the Shindler soils; on backslopes

Use and Management

Major land use: Rangeland

Other land uses: Pasture and recreation; woodland on many of the steeper north- and east-facing slopes
Suitability for crops: The soils in this association are unsuited to cultivated crops. Small areas where slopes are less than 15 percent are suited to tame pasture and hay.
Management considerations: Controlling water erosion and conserving moisture are the main management concerns. The high content of lime in the Steinauer soils adversely affects the availability of plant nutrients.

9. Grovena-Dobalt-Flandreau Association

Well drained, nearly level to strongly sloping, loamy soils on till plains and moraines

Composition

Extent of the association in the survey area: 3 percent
Extent of the soils in the association:
Grovena and similar soils—35 percent
Dobalt and similar soils—23 percent
Flandreau and similar soils—10 percent
Soils of minor extent—32 percent

Setting

Landform: Till plains and moraines
Position on the landform: Summits and backslopes
Slope range: Grovena—0 to 15 percent; Dobalt—0 to 6 percent; Flandreau—0 to 9 percent
Texture of the surface layer: Grovena—loam; Dobalt—loam; Flandreau—clay loam

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting layer: Grovena—more than 40 inches over loamy glacial till or sandy material; Dobalt—20 to 40 inches over loamy glacial till; Flandreau—25 to 40 inches over sandy material and more than 40 inches over loamy glacial till
Depth to the water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Grovena—moderate; Dobalt—moderately slow; Flandreau—moderate in the loamy sediments, rapid in the underlying sandy material, and moderately slow in the underlying loamy glacial till
Available water capacity: Grovena—high; Dobalt—high; Flandreau—moderate
Content of organic matter: Moderate
Surface runoff class: Grovena—low to high; Dobalt—low or medium; Flandreau—low or medium

Soils of Minor Extent

- The well drained Blendon soils, which formed in loamy glaciofluvial sediments; on footslopes
- The moderately well drained Bonilla soils, which formed in loamy eolian material; on footslopes
- The somewhat poorly drained Chancellor soils on toeslopes
- The somewhat poorly drained Chaska soils on low flood plains
- The well drained Nora soils, which formed in loess; on backslopes
- The very poorly drained Obert soils on low flood plains
- The well drained Shindler soils, which formed in firm, clay loam glacial till; on shoulders
- The somewhat excessively drained Thurman soils on shoulders
- The moderately well drained, silty Trent soils on footslopes
- The moderately well drained, calcareous Wakonda soils on footslopes
- The somewhat poorly drained Whitewood soils, which formed in alluvium; on toeslopes

Use and Management

Major land use: Cropland
Other land uses: Pasture and hay; range
Main crops: Corn, soybeans, and alfalfa
Suitability for crops: The soils in this association are well suited to cultivated crops and to tame pasture and hay.
Management considerations: Controlling water erosion and conserving moisture are the main management concerns.

10. Flandreau-Thurman-Grovena Association

Well drained and somewhat excessively drained, nearly level to strongly sloping, loamy soils on till plains and moraines

Composition

Extent of the association in the survey area: 6 percent
Extent of the soils in the association:
Flandreau and similar soils—34 percent
Thurman and similar soils—15 percent
Grovena and similar soils—10 percent
Soils of minor extent—41 percent

Setting

Landform: Till plains and moraines
Position on the landform: Flandreau—summits and backslopes; Thurman—shoulders and backslopes; Grovena—summits and backslopes
Slope range: Flandreau—0 to 9 percent; Thurman—2 to 15 percent; Grovena—0 to 15 percent;
Texture of the surface layer: Flandreau—loam; Thurman—fine sandy loam; Grovena—loam

Soil Properties and Qualities

Drainage class: Flandreau—well drained; Thurman—somewhat excessively drained; Grovena—well drained
Depth to bedrock: Very deep
Depth to contrasting layer: Flandreau—25 to 40 inches over sandy material; Thurman—more than 60 inches; Grovena—more than 40 inches over loamy glacial till or sandy material
Depth to the water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Flandreau—moderate in the loamy sediments, rapid in the underlying sandy material, and moderately slow in the underlying loamy glacial till; Thurman—rapid; Grovena—moderate
Available water capacity: Flandreau—moderate; Thurman—low; Grovena—high
Content of organic matter: Flandreau—moderate; Thurman—moderately low; Grovena—moderate
Surface runoff class: Flandreau—low or medium; Thurman—very low or low; Grovena—low to high

Soils of Minor Extent

• The well drained Blendon soils, which formed in loamy glaciofluvial sediments; on footslopes
• The somewhat poorly drained Chaska soils on low flood plains
• The well drained Dempster soils, which formed in loess or silty alluvium 20 to 40 inches thick over glacial outwash
• The well drained Dobalt soils, which formed in loamy material 20 to 40 inches thick over glacial till; in landscape positions similar to those of the Flandreau and Grovena soils
• The well drained, silty Nora soils in landscape positions similar to those of the Flandreau and Grovena soils
• The very poorly drained Obert soils on low flood plains
• The well drained Shindler soils, which are calcareous at a depth of 8 inches or less; on the steeper slopes
• The well drained Splitrock soils, which formed in loess 22 to 40 inches thick over loamy glacial till; in landscape positions similar to those of the Flandreau and Grovena soils
• The somewhat poorly drained Whitewood soils, which formed in silty alluvium; on toeslopes

Use and Management

Major land use: Cropland
Other land uses: Pasture and hay; range
Main crops: Corn, soybeans, and alfalfa
Suitability for crops: The Flandreau and Grovena soils are well suited to cultivated crops and to tame pasture and hay. The Thurman soils are poorly suited to cultivated crops and to tame pasture and hay.
Management considerations: Controlling water erosion and conserving moisture are the main management concerns. Controlling wind erosion and agrochemical leaching and runoff are additional concerns in areas of the Thurman soils.

Nearly Level to Gently Sloping, Silty Soils on Outwash Plains

These soils formed in silty sediments, silty alluvium, or loess over gravelly material. They make up about 4 percent of the county. Most areas are used for cultivated crops. Conserving moisture, controlling water erosion, and agrochemical leaching are the main management concerns. Proper grazing management is an important concern in areas of pasture and rangeland.

11. Dempster-Graceville Association

Well drained, nearly level to gently sloping, silty soils on outwash plains

Composition

Extent of the association in the survey area: 4 percent
Extent of the soils in the association:
Dempster and similar soils—33 percent
Graceville and similar soils—19 percent
Soils of minor extent—48 percent

Setting

Landform: Outwash plains
Position on the landform: Dempster—summits and backslopes; Graceville—footslopes
Slope range: Dempster—0 to 6 percent; Graceville—0 to 2 percent
Texture of the surface layer: Dempster—silt loam; Graceville—silty clay loam

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting layer: Dempster—20 to 40 inches over gravelly material; Graceville—40 to 60 inches over gravelly material
Depth to the water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderate in the silty sediments and rapid in the gravelly material
Available water capacity: Dempster—moderate; Graceville—high
Content of organic matter: Dempster—moderate; Graceville—high
Surface runoff class: Dempster—low or medium; Graceville—low

Soils of Minor Extent

• The moderately well drained, silty Alcester soils on high flood plains and footslopes on fans
• The well drained, loamy Davis soils on footslopes on fans
• The somewhat poorly drained, loamy Chaska soils on low flood plains
• The somewhat excessively drained Delmont soils, which formed in loamy alluvium 14 to 20 inches thick over sand and gravel; on shoulders and backslopes on outwash plains
• The well drained Ihlen soils, which formed in 20 to 40 inches of silty material over Sioux quartzite; on shoulders, backslopes, and footslopes
• The somewhat poorly drained, silty Lamo soils on low flood plains
• The excessively drained Talmo soils on shoulders of terrace escarpments

Use and Management

Major land use: Cropland
Other land uses: Pasture and hay; range
Main crops: Corn, soybeans, and alfalfa
Suitability for crops: The soils in this association are well suited to cultivated crops and to tame pasture and hay.
Management considerations: Controlling water erosion, conserving moisture, and agrochemical leaching are the main management concerns.

Level to Moderately Sloping, Loamy, Silty, and Clayey Soils on Flood Plains, Outwash Plains, and Terraces

These soils formed in alluvium and lacustrine sediments. They make up about 10 percent of the county. Most areas are used for cultivated crops. Wetness, wind erosion, a high content of lime, a slow rate of water infiltration, and soil compaction are the main management concerns.

12. Clamo-Chaska Association

Poorly drained and somewhat poorly drained, level and nearly level, clayey and loamy soils on flood plains (fig. 5)

Composition

Extent of the association in the survey area: 4 percent
Extent of the soils in the association:
Clamo and similar soils—61 percent
Chaska and similar soils—12 percent
Soils of minor extent—27 percent

Setting

Landform: Flood plains
Position on the landform: Low flood plains
Slope range: Clamo—0 to 1 percent; Chaska—0 to 2 percent
Texture of the surface layer: Clamo—silty clay; Chaska—loam

Soil Properties and Qualities

Drainage class: Clamo—poorly drained; Chaska—somewhat poorly drained
Depth to bedrock: Very deep
Depth to contrasting layer: More than 60 inches
Depth to the water table: Clamo—0.5 foot to 1.5 feet; Chaska—0.5 foot to 2.5 feet
Flooding: Clamo—occasional for long periods; Chaska—occasional for brief periods or frequent for long periods
Ponding: None
Permeability: Clamo—slow; Chaska—moderate
Available water capacity: High
Content of organic matter: Clamo—high; Chaska—moderate
Surface runoff class: Low

Soils of Minor Extent

• The well drained, silty Alcester soils on high flood plains
• The very poorly drained Baltic soils in basins and in oxbows on low flood plains
• The moderately well drained, loamy Bon soils on high flood plains
• The somewhat poorly drained Dimo soils, which have sand and gravel at a depth of 20 to 40 inches; on high flood plains
• The well drained Graceville soils, which have sand

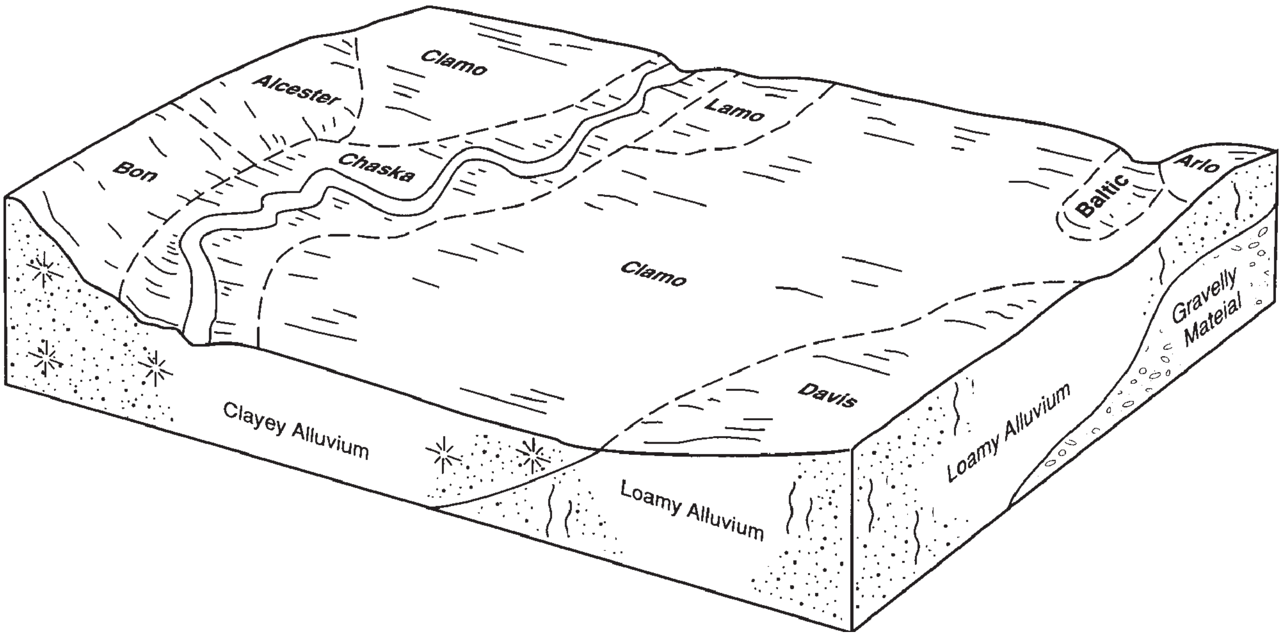

Figure 5.—Typical pattern of soils and parent material in the Clamo-Chaska association.

and gravel at a depth of 40 to 60 inches; on footslopes on outwash plains

• The moderately well drained, loamy Janude soils on high flood plains

• The somewhat poorly drained, silty Lamo soils in positions on the flood plain slightly higher than those of the Clamo soils

Use and Management

Major land use: Cropland
Other land uses: Pasture and hay; range
Main crops: Corn and soybeans
Suitability for crops: The soils in this association are poorly suited to cultivated crops and to tame pasture and hay.
Management considerations: Wetness and wind erosion are the main management concerns. Soil compaction is an additional concern in areas of the Clamo soils if they are tilled when wet. Also, the high content of lime in the Chaska soils adversely affects the availability of plant nutrients.

13. Bon-Davis-Chaska Association

Somewhat poorly drained to well drained, nearly level to gently sloping, loamy soils on flood plains

Composition

Extent of the association in the survey area: 1 percent
Extent of the soils in the association:
Bon and similar soils—21 percent
Davis and similar soils—21 percent
Chaska and similar soils—11 percent
Components of minor extent—47 percent

Setting

Landform: Flood plains
Position on the landform: Bon—high flood plains; Davis—high flood plains; Chaska—low flood plains
Slope range: Bon—0 to 2 percent; Davis—0 to 6 percent; Chaska—0 to 2 percent
Texture of the surface layer: Loam

Soil Properties and Qualities

Drainage class: Bon—moderately well drained; Davis—well drained and moderately well drained; Chaska—somewhat poorly drained
Depth to bedrock: Very deep
Depth to contrasting layer: More than 60 inches
Depth to the water table: Bon—3 to 5 feet; Davis—more than 3 feet; Chaska—0.5 foot to 2.5 feet
Flooding: Bon—occasional for brief periods; Davis—rare or none; Chaska—occasional for brief periods or frequent for long periods
Ponding: None
Permeability: Moderate
Available water capacity: High

Content of organic matter: Bon—high; Davis—high; Chaska—moderate
Surface runoff class: Bon—low; Davis—low or medium; Chaska—low

Components of Minor Extent

• The somewhat poorly drained Arlo soils, which have sand and gravel at a depth of 20 to 40 inches; on low flood plains
• The very poorly drained Baltic soils in basins and in oxbows on low flood plains
• The poorly drained, clayey Clamo soils on low flood plains
• The well drained Dempster soils, which formed in loess or silty alluvium 20 to 40 inches thick over sand and gravel; on summits and backslopes on outwash plains
• The somewhat excessively drained Delmont soils, which formed in loamy alluvium 14 to 20 inches thick over sand and gravel; on shoulders and backslopes on outwash plains
• The somewhat poorly drained, silty Lamo soils in positions on the flood plain slightly lower than those of the Bon soils
• The well drained Ihlen soils, which formed in loess 20 to 40 inches thick over hard bedrock; on backslopes of adjacent dissected plains
• Rock outcrop consisting of Sioux quartzite; adjacent to the channel in some areas

Use and Management

Major land use: Cropland
Other land uses: Pasture and hay; range
Main crops: Corn and soybeans
Suitability for crops: The Bon and Davis soils are well suited to cultivated crops and to tame pasture and hay. The Chaska soils are generally unsuited to cultivated crops and to tame pasture and hay.
Management considerations: Controlling wetness caused by flooding, conserving moisture, controlling water erosion, and controlling wind erosion are the main management concerns. The high content of lime in the Chaska soils adversely affects the availability of plant nutrients.

14. Chaska-Davis-Bon Association

Somewhat poorly drained, moderately well drained, and well drained, nearly level to gently sloping, loamy soils on flood plains

Composition

Extent of the association in the survey area: 3 percent
Extent of the soils in the association:
Chaska and similar soils—30 percent
Davis and similar soils—18 percent
Bon and similar soils—13 percent
Components of minor extent—39 percent

Setting

Landform: Flood plains
Position on the landform: Chaska—low flood plains; Davis—high flood plains; Bon—high flood plains
Slope range: Chaska—0 to 2 percent; Davis—0 to 6 percent; Bon—0 to 2 percent
Texture of the surface layer: Loam

Soil Properties and Qualities

Drainage class: Chaska—somewhat poorly drained; Davis—well drained and moderately well drained; Bon—moderately well drained
Depth to bedrock: Very deep
Depth to contrasting layer: More than 60 inches
Depth to the water table: Chaska—0.5 foot to 2.5 feet; Davis—more than 3 feet; Bon—3 to 5 feet
Flooding: Chaska—occasional for brief periods or frequent for long periods; Davis—rare or none; Bon—occasional for brief periods
Ponding: None
Permeability: Moderate
Available water capacity: High
Content of organic matter: Chaska—moderate; Davis—high; Bon—high
Surface runoff class: Chaska—low; Davis—low or medium; Bon—low

Components of Minor Extent

• The well drained, silty Alcester soils in landscape positions similar to those of the Davis soils
• The somewhat poorly drained Arlo soils, which have sand and gravel at a depth of 20 to 40 inches; on low flood plains
• The very poorly drained Baltic soils in basins and in oxbows on low flood plains
• The poorly drained, clayey Clamo soils on low flood plains
• The somewhat excessively drained Delmont soils, which formed in loamy alluvium 14 to 20 inches thick over sand and gravel; on shoulders and backslopes of outwash plains
• The well drained Dempster soils, which formed in loess or silty alluvium 20 to 40 inches thick over sand and gravel; on backslopes of outwash plains
• The well drained Graceville soils, which formed in loess or silty alluvium 40 to 60 inches thick over sand and gravel; on footslopes of outwash plains

• The well drained Ihlen soils, which formed in loess 20 to 40 inches thick over hard bedrock; on backslopes of adjacent dissected plains
• The somewhat poorly drained, silty Lamo soils in slightly lower positions on the flood plain than those of the Bon soils
• Rock outcrop consisting of Sioux quartzite; adjacent to the channel in some areas
• The somewhat poorly drained, silty Whitewood soils on toeslopes

Use and Management

Major land use: Cropland
Other land uses: Pasture and hay, range, and recreation
Main crops: Corn and soybeans
Suitability for crops: The Chaska soils are unsuited to cultivated crops and to tame pasture and hay. The Davis and Bon soils are well suited to cultivated crops and to tame pasture and hay.
Management considerations: Controlling wetness caused by flooding, conserving moisture, controlling water erosion, and controlling wind erosion and streambank erosion are the main management concerns. The high content of lime in the Chaska soils adversely affects the availability of plant nutrients.

15. Lamo-Graceville Association

Somewhat poorly drained and well drained, level and nearly level, silty soils on flood plains and outwash plains

Composition

Extent of the association in the survey area: 1 percent
Extent of the soils in the association:
Lamo and similar soils—30 percent
Graceville and similar soils—29 percent
Soils of minor extent—41 percent

Setting

Landform: Flood plains and outwash plains
Position on the landform: Lamo—low flood plains; Graceville—footslopes
Slope range: Lamo—0 to 1 percent; Graceville—0 to 2 percent
Texture of the surface layer: Silty clay loam

Soil Properties and Qualities

Drainage class: Lamo—somewhat poorly drained; Graceville—well drained
Depth to bedrock: Very deep
Depth to contrasting layer: Lamo—more than 60 inches; Graceville—40 to 60 inches over gravelly material
Depth to the water table: Lamo—1 to 3 feet; Graceville—more than 6 feet
Flooding: Lamo—occasional or frequent for brief periods; Graceville—none
Ponding: None
Permeability: Lamo—moderately slow; Graceville—moderate in the silty sediments and rapid in the underlying gravelly material
Available water capacity: High
Content of organic matter: Lamo—moderate; Graceville—high
Surface runoff class: Low

Soils of Minor Extent

• The well drained, silty Alcester soils on footslopes on fans
• The poorly drained, loamy Arlo soils, which have 20 to 40 inches of loamy material over sand and gravel; on low flood plains
• The very poorly drained Baltic soils in basins and in oxbows on low flood plains
• The moderately well drained, loamy Bon soils on high flood plains
• The somewhat poorly drained, loamy Chaska soils, which are more stratified than the Lamo soils; on low flood plains
• The poorly drained, clayey Clamo soils on low flood plains

Use and Management

Major land use: Cropland
Other land uses: Pasture and hay; range
Main crops: Corn and soybeans
Suitability for crops: The Lamo soils are generally suited to cultivated crops and to tame pasture and hay. The Graceville soils are well suited to cultivated crops and to tame pasture and hay.
Management considerations: Lamo—reducing wetness after flooding and the high content of lime, which adversely affects the availability of plant nutrients; Graceville—conserving moisture and agrochemical leaching

16. Corson-Benclare Association

Moderately well drained and well drained, nearly level to moderately sloping, silty and clayey soils on terraces

Composition

Extent of the association in the survey area: 1 percent

Extent of the soils in the association:
Benclare and similar soils—47 percent
Corson and similar soils—26 percent
Soils of minor extent—27 percent

Setting

Landform: Terraces
Position on the landform: Benclare—footslopes; Corson—summits and backslopes
Slope range: Benclare—0 to 2 percent; Corson—0 to 9 percent
Texture of the surface layer: Silty clay

Soil Properties and Qualities

Drainage class: Corson—well drained; Benclare—moderately well drained
Depth to bedrock: Very deep
Depth to contrasting layer: More than 60 inches
Depth to the water table: Corson—more than 6 feet; Benclare—3 to 5 feet
Flooding: None
Ponding: None
Permeability: Slow
Available water capacity: High
Content of organic matter: Corson—moderate; Benclare—high
Surface runoff class: Corson—low to high; Benclare—low

Soils of Minor Extent

- The somewhat poorly drained Chancellor soils on toeslopes
- The well drained Henkin soils, which contain more sand throughout than the Corson and Benclare soils; on summits and backslopes on escarpments
- The well drained Moody soils, which formed in loess; in areas adjacent to those of the major soils
- The very poorly drained Obert soils on low flood plains

Use and Management

Major land use: Cropland
Other land uses: Pasture and hay; range
Main crops: Corn, soybeans, and alfalfa
Suitability for crops: The Corson soils are fairly well suited to cultivated crops and to tame pasture and hay. The Benclare soils are well suited to cultivated crops and to tame pasture and hay.
Management considerations: Corson—controlling water erosion, controlling wind erosion, and conserving moisture; Benclare—controlling wetness

Detailed Soil Map Units

The map units delineated on the detailed soil maps in this survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this section, along with the maps, can be used to determine the suitability and potential of a unit for specific uses. They also can be used to plan the management needed for those uses. More information about each map unit is given under the heading "Use and Management of the Soils."

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils and miscellaneous areas are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some "included" areas that belong to other taxonomic classes.

Most included soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, inclusions. They may or may not be mentioned in the map unit description. Other included soils and miscellaneous areas, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, inclusions. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. The included areas of contrasting soils or miscellaneous areas are mentioned in the map unit descriptions. A few included areas may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of included areas in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans, but if intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series.* Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases.* Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Moody silty clay loam, 2 to 6 percent slopes, is a phase of the Moody series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are called complexes. A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Nora-Crofton complex, 6 to 9 percent slopes, is an example.

This survey includes *miscellaneous areas.* Such areas have little or no soil material and support little or

no vegetation. The map unit Pits, quarry, is an example.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see Contents) give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils or miscellaneous areas.

AcA—Alcester silty clay loam, 0 to 2 percent slopes

Composition

Alcester and similar soils: 75 to 95 percent
Contrasting inclusions: 5 to 25 percent

Setting

Landform: High flood plains
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 10 to 100 acres

Typical Profile

Surface soil:
0 to 16 inches—dark gray silty clay loam

Subsoil:
16 to 36 inches—dark gray silty clay loam
36 to 50 inches—grayish brown silty clay loam
50 to 60 inches—light olive brown silty clay loam
60 to 80 inches—light olive brown, calcareous silty clay loam

Soil Properties and Qualities

Drainage class: Moderately well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 40 inches over clayey alluvium
Depth to high water table: 3 to 6 feet
Frequency of flooding: Rare
Ponding: None
Permeability: Moderate
Available water capacity: High
Content of organic matter: High
Surface runoff class: Low
Other properties: Runoff water flows over this soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
- The well drained Graceville soils, which have gravelly material at a depth of 40 to 60 inches; on footslopes
- The somewhat poorly drained Whitewood soils on toeslopes

Similar inclusions:
- Soils in which the content of organic matter decreases regularly with increasing depth

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited (fig. 6)
Management concerns: Few limitations
Management considerations:
- Managing crop residue conserves moisture and helps to maintain tilth and the content of organic matter.

Interpretive Groups

Land capability classification: 1
Range site: Loamy Overflow
Windbreak suitability group: 1
Pasture suitability group: K

AcB—Alcester silty clay loam, 2 to 6 percent slopes

Composition

Alcester and similar soils: 85 to 99 percent
Contrasting inclusions: 1 to 15 percent

Setting

Landform: Fans
Position on the landform: Footslopes
Slope range: 2 to 6 percent
Shape of areas: Irregular
Size of areas: 10 to 100 acres

Typical Profile

Surface soil:
0 to 16 inches—dark gray silty clay loam

Subsoil:
16 to 36 inches—dark gray silty clay loam
36 to 50 inches—grayish brown silty clay loam
50 to 60 inches—light olive brown silty clay loam
60 to 80 inches—light olive brown, calcareous silty clay loam

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 40 inches over clayey alluvium

Figure 6.—Corn in an area of Alcester silty clay loam, 0 to 2 percent slopes. This productive soil is on high flood plains. The farmstead in the background is in an area of Alcester silty clay loam, 2 to 6 percent slopes.

Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderate
Available water capacity: High
Content of organic matter: High
Surface runoff class: Medium
Other properties: Runoff water flows over this soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
• The well drained Graceville soils, which have gravelly material at a depth of 40 to 60 inches; on footslopes
• Moody soils, which do not have dark colors extending past a depth of 20 inches; on backslopes

Similar inclusions:
• Soils in which the content of organic matter decreases regularly with increasing depth

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Water erosion
Management considerations:
• Minimizing tillage and leaving crop residue on the

surface help to control erosion and conserve moisture. Contour farming and grassed waterways help to control water erosion.
• Including grasses and legumes in the rotation helps to control erosion and helps to maintain tilth and the content of organic matter.

Interpretive Groups

Land capability classification: 2e
Range site: Silty
Windbreak suitability group: 3
Pasture suitability group: F

Ar—Arlo loam, 0 to 1 percent slopes

Composition

Arlo and similar soils: 70 to 90 percent
Contrasting inclusions: 10 to 30 percent

Setting

Landform: Low flood plains
Slope range: 0 to 1 percent
Shape of areas: Irregular
Size of areas: 10 to 100 acres

Typical Profile

Surface layer:
0 to 10 inches—very dark gray, calcareous loam

Subsoil:
10 to 14 inches—dark grayish brown, calcareous loam that has redoximorphic concentrations
14 to 20 inches—grayish brown, calcareous loam that has redoximorphic concentrations
20 to 30 inches—grayish brown, calcareous loam that has redoximorphic concentrations

Underlying layer:
30 to 80 inches—light olive brown, calcareous gravelly sand that has redoximorphic concentrations

Soil Properties and Qualities

Drainage class: Poorly drained
Depth to bedrock: Very deep
Depth to contrasting parent material: 20 to 40 inches over gravelly material
High water table: At the surface to 1.5 feet below the surface
Flooding: Occasional for brief periods
Ponding: None
Permeability: Moderate in the loamy sediments and very rapid in the underlying gravelly material
Available water capacity: Moderate
Content of organic matter: Moderate
Surface runoff class: Very low
Other properties: This soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The moderately well drained Bon soils, which do not have gravelly material within a depth of 40 inches; on high flood plains
• The somewhat poorly drained Dimo soils, which do not have lime in the upper 20 inches; on high flood plains
• The well drained Graceville soils, which do not have gravelly material within a depth of 40 inches; on footslopes
• The somewhat poorly drained Lamo and Chaska soils, which do not have gravelly material within a depth of 40 inches; on low flood plains

Similar inclusions:
• Soils that have a surface layer and subsoil of silt loam or silty clay loam

Use and Management

Cropland and pasture

Main crops: Corn, oats, soybeans, and spring wheat
Suitability for crops: Poorly suited
Management concerns: Flooding, high water table, wind erosion, the high content of lime (which adversely affects the availability of plant nutrients), wind erosion, and agrochemical leaching
Management considerations:
• In wet years this soil is better suited to early maturing crops than to some other crops. Leaving crop residue on the surface and deferring tillage when the soil is wet help to maintain tilth and control wind erosion.
• Including grasses and legumes in the rotation helps to control erosion and helps to maintain the content of organic matter, fertility, and tilth.
• Applying nitrogen close to the time when crops will use it reduces the amount of time available for leaching.
• Maintaining existing drainage systems helps to remove excess water.
• Permanent pasture or hayland species should be established.

Interpretive Groups

Land capability classification: 4w
Range site: Subirrigated
Windbreak suitability group: 10
Pasture suitability group: A

Ba—Baltic silty clay loam, 0 to 1 percent slopes

Composition

Baltic and similar soils: 75 to 99 percent
Contrasting inclusions: 1 to 25 percent

Setting

Landform: Till plains and flood plains
Position on the landform: Basins and low flood plains
Slope range: 0 to 1 percent
Shape of areas: Oval or elongated
Size of areas: 5 to 100 acres

Typical Profile

Surface layer:
0 to 7 inches—very dark gray, calcareous silty clay loam

Subsurface layer:
7 to 12 inches—very dark gray, calcareous silty clay that has redoximorphic concentrations

Subsoil:
12 to 26 inches—very dark gray, calcareous silty clay that has redoximorphic concentrations
26 to 38 inches—dark gray, calcareous silty clay loam that has redoximorphic concentrations
38 to 55 inches—gray, calcareous silty clay loam that has redoximorphic concentrations

Underlying layer:
55 to 80 inches—light gray, calcareous silty clay loam that has redoximorphic concentrations and depletions

Soil Properties and Qualities

Drainage class: Very poorly drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
High water table: 2 feet above to 1.5 feet below the surface
Flooding: None
Ponding: Frequent for long periods
Permeability: Slow
Available water capacity: High
Content of organic matter: High
Surface runoff class: Negligible
Other properties: This soil has a high content of lime. Many areas are artificially drained.

Inclusions

Contrasting inclusions:
• The moderately well drained Davison and Wakonda soils, which have a higher content of lime than the Baltic soil; on footslopes at the outer edge of some areas
• The very poorly drained Worthing soils, which do not contain lime in the upper layers; in basins

Use and Management

Rangeland and cropland

Main crops: Drained areas—corn, soybeans, oats, and spring wheat; undrained areas—none
Suitability for crops: Generally unsuited
Management concerns: Ponding, high water table, wind erosion, a slow rate of water infiltration, and the high content of lime, which adversely affects the availability of plant nutrients
Management considerations:
• Proper grazing management helps to maintain plant vigor.
• Deferring tillage when the soil is wet helps to prevent soil compaction.
• Restricting grazing during wet periods helps to prevent soil compaction.
• Maintaining existing drainage systems helps to remove excess water.
• Areas of this soil should be maintained for wildlife habitat.

Interpretive Groups

Land capability classification: 5w
Range site: Shallow Marsh
Windbreak suitability group: 10
Pasture suitability group: B2

Bb—Baltic silty clay loam, ponded

Composition

Baltic and similar soils: 80 to 99 percent
Contrasting inclusions: 1 to 20 percent

Setting

Landform: Till plains and flood plains
Position on the landform: Basins and low flood plains
Slope range: 0 to 1 percent
Shape of areas: Oval or elongated
Size of areas: 10 to 100 acres

Typical Profile

Surface layer:
0 to 7 inches—very dark gray, calcareous silty clay loam

Subsurface layer:
7 to 12 inches—very dark gray, calcareous silty clay that has redoximorphic concentrations

Subsoil:
12 to 26 inches—very dark gray, calcareous silty clay that has redoximorphic concentrations
26 to 38 inches—dark gray, calcareous silty clay loam that has redoximorphic concentrations
38 to 55 inches—gray, calcareous silty clay loam that has redoximorphic concentrations

Underlying layer:
55 to 80 inches—light gray, calcareous silty clay loam that has redoximorphic concentrations and depletions

Soil Properties and Qualities

Drainage class: Very poorly drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
Depth to high water table: 2 feet above to 1.5 feet below the surface
Flooding: None
Ponding: Frequent for very long periods
Permeability: Slow
Available water capacity: High
Content of organic matter: High
Surface runoff class: Negligible
Other properties: This soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The moderately well drained Davison and Wakonda soils, which have a higher content of lime than the Baltic soil; on footslopes at the outer edge of some areas
• The very poorly drained Worthing soils, which do not contain lime in the upper layers; in basins

Use and Management

Wildlife habitat

Suitability for crops: Unsuited
Management concerns: Ponding, high water table, a slow rate of water infiltration, and the high content of lime, which adversely affects the availability of plant nutrients
Management considerations:
• Areas of this soil should be maintained for wildlife habitat, native vegetation, and ground-water recharge.

Interpretive Groups

Land capability classification: 8w
Range site: Not assigned
Windbreak suitability group: 10
Pasture suitability group: NS

BcA—Benclare-Corson complex, 0 to 2 percent slopes

Composition

Benclare and similar soils: 50 to 75 percent
Corson and similar soils: 20 to 45 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Terraces
Position on the landform: Benclare—footslopes; Corson—summits and backslopes
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 10 to 500 acres

Typical Profile

Benclare

Surface layer:
0 to 8 inches—dark gray silty clay loam

Subsoil:
8 to 15 inches—dark gray silty clay
15 to 31 inches—grayish brown and dark gray silty clay
31 to 42 inches—light brownish gray, calcareous silty clay
42 to 52 inches—pale olive, calcareous clay that has redoximorphic concentrations and depletions

Underlying layer:
52 to 80 inches—pale yellow, calcareous clay that has redoximorphic depletions

Corson

Surface layer:
0 to 6 inches—dark gray silty clay

Subsoil:
6 to 16 inches—dark gray silty clay
16 to 25 inches—grayish brown, calcareous silty clay
25 to 39 inches—light brownish gray, calcareous silty clay
39 to 49 inches—light brownish gray, calcareous silty clay that has redoximorphic concentrations

Underlying layer:
49 to 80 inches—light brownish gray, calcareous silty clay that has redoximorphic depletions

Soil Properties and Qualities

Drainage class: Benclare—moderately well drained; Corson—well drained

Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
Depth to high water table: Benclare—3 to 5 feet; Corson—more than 6 feet
Flooding: None
Ponding: None
Permeability: Slow
Available water capacity: High
Content of organic matter: Benclare—high; Corson—moderate
Surface runoff class: Low
Other properties: Runoff water flows over the Benclare soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Chancellor soils on toeslopes
- The well drained Moody soils, which have less clay than the Corson soil; on summits and backslopes
- The well drained Henkin soils, which have more sand and less clay than the Corson soil; on summits and backslopes

Similar inclusions:
- Soils that contain less clay than the Benclare soil

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Benclare—a slow rate of water infiltration; Corson—a slow rate of water infiltration, wind erosion
Management considerations:
- Leaving crop residue on the surface, minimizing tillage, tilling in a timely manner, and including grasses and legumes in the cropping system conserve moisture, help to control erosion, and help to maintain the content of organic matter, fertility, and tilth.
- Chiseling or subsoiling when the soil is dry improves tilth and increases the rate of water infiltration.

Interpretive Groups

Land capability classification: Benclare—1; Corson—2s
Range site: Benclare—Loamy Overflow; Corson—Clayey
Windbreak suitability group: Benclare—4; Corson—4C
Pasture suitability group: Benclare—K; Corson—E

BeE—Betts-Ethan loams, 15 to 40 percent slopes

Composition

Betts and similar soils: 30 to 55 percent
Ethan and similar soils: 25 to 45 percent
Contrasting inclusions: 5 to 25 percent

Setting

Landform: Moraines
Position on the landform: Betts—shoulders; Ethan—backslopes
Slope range: 15 to 40 percent
Shape of areas: Irregular or elongated
Size of areas: 10 to 100 acres

Typical Profile

Betts

Surface layer:
0 to 5 inches—dark grayish brown, calcareous loam

Subsoil:
5 to 26 inches—light yellowish brown, calcareous clay loam

Underlying layer:
26 to 35 inches—light yellowish brown, calcareous clay loam that has relict redoximorphic features
35 to 80 inches—light yellowish brown, calcareous clay loam that has relict redoximorphic features

Ethan

Surface layer:
0 to 9 inches—grayish brown, calcareous loam

Subsoil:
9 to 39 inches—light brownish gray, calcareous clay loam that has relict redoximorphic features

Underlying layer:
39 to 80 inches—light brownish gray, calcareous clay loam that has relict redoximorphic features

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High

Content of organic matter: Moderately low
Surface runoff class: High
Other properties: Both soils have a high content of lime.

Inclusions

Contrasting inclusions:
• The moderately well drained Bonilla and Trent soils on footslopes
• The well drained Clarno and Egan soils, which do not have lime in the upper 12 inches; on backslopes
• The moderately well drained Davison soils on footslopes adjacent to wet areas
• The very poorly drained Worthing soils in basins
• The excessively drained Talmo soils, which have gravelly material within a depth of 14 inches; on shoulders

Similar inclusions:
• Soils that have more silt and less sand than the Betts and Ethan soils

Use and Management

Rangeland

Suitability for crops: Generally unsuited
Management concerns: Wind erosion, water erosion, and the high content of lime, which adversely affects the availability of plant nutrients
Management considerations:
• Proper grazing management helps to maintain plant vigor, conserves moisture, and helps to control erosion.

Interpretive Groups

Land capability classification: Betts—7e; Ethan—7e
Range site: Betts—Thin Upland; Ethan—Thin Upland
Windbreak suitability group: Betts—10; Ethan—10
Pasture suitability group: Betts—NS; Ethan—NS

BfA—Blendon fine sandy loam, 0 to 2 percent slopes

Composition

Blendon and similar soils: 80 to 95 percent
Contrasting inclusions: 5 to 20 percent

Setting

Landform: Outwash plains
Position on the landform: Footslopes
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 10 to 80 acres

Typical Profile

Surface soil:
0 to 12 inches—dark grayish brown fine sandy loam

Subsoil:
12 to 28 inches—dark grayish brown fine sandy loam

Underlying layer:
28 to 74 inches—grayish brown and light olive brown loamy fine sand and fine sand
74 to 80 inches—brown clay loam

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 40 inches over loamy material
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderately rapid in the fine sandy loam material and moderately slow in the underlying clay loam
Available water capacity: Moderate
Content of organic matter: Moderate
Surface runoff class: Low
Other properties: Runoff water flows over this soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
• The well drained Davis soils, which contain less sand and more clay in the surface layer and subsoil than the Blendon soil; on footslopes
• The well drained Dobalt soils, which are dark to a depth of less than 16 inches and contain more clay in the subsoil than the Blendon soil; on summits and backslopes
• The somewhat excessively drained Thurman soils, which contain more sand and less clay in the subsoil than the Blendon soil; on summits and shoulders

Similar inclusions:
• Soils that are dark to a depth of less than 20 inches

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: The restricted available

water capacity, wind erosion, and agrochemical leaching

Management considerations:

• This soil is better suited to early maturing crops, such as small grain, than to some other crops. Minimizing tillage, leaving crop residue on the surface, and including grasses and legumes in the cropping system help to control erosion, conserve moisture, and maintain the content of organic matter.

• Wind stripcropping and field windbreaks help to control wind erosion.

• Applying nitrogen close to the time when crops will use it reduces the amount of time available for leaching.

Interpretive Groups

Land capability classification: 2s
Range site: Sandy
Windbreak suitability group: 5
Pasture suitability group: H

BhB—Blendon-Henkin fine sandy loams, 2 to 6 percent slopes

Composition

Blendon and similar soils: 45 to 70 percent
Henkin and similar soils: 15 to 35 percent
Contrasting inclusions: 10 to 25 percent

Setting

Landform: Outwash plains
Position on the landform: Blendon—footslopes; Henkin—summits and backslopes
Slope range: 2 to 6 percent
Shape of areas: Irregular
Size of areas: 10 to 100 acres

Typical Profile

Blendon

Surface soil:
0 to 12 inches—dark grayish brown fine sandy loam

Subsoil:
12 to 28 inches—dark grayish brown fine sandy loam

Underlying layer:
28 to 74 inches—grayish brown and light olive brown loamy fine sand and fine sand
74 to 80 inches—brown clay loam

Henkin

Surface layer:
0 to 9 inches—dark grayish brown fine sandy loam

Subsoil:
9 to 25 inches—brown fine sandy loam
25 to 46 inches—pale brown, calcareous fine sandy loam

Underlying layer:
46 to 59 inches—light yellowish brown, calcareous fine sandy loam
59 to 80 inches—light yellowish brown, calcareous fine sandy loam that has redoximorphic depletions in the upper part and redoximorphic concentrations and depletions in the lower part

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: Blendon—more than 40 inches over loamy material; Henkin—more than 40 inches over loamy glacial till or gravelly material
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Blendon—moderately rapid in the fine sandy loam material and moderately slow in the underlying clay loam; Henkin—moderately rapid
Available water capacity: Moderate
Content of organic matter: Blendon—moderate; Henkin—moderately low
Surface runoff class: Medium
Other properties: Runoff water flows over the Blendon soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:

• The well drained Davis soils, which contain less sand and more clay in the surface layer and subsoil than the major soils; on footslopes

• The well drained Dobalt soils, which are dark to a depth of less than 20 inches and contain more clay in the subsoil than the major soils; on summits and backslopes

• The well drained Flandreau soils, which contain less sand and more clay in the surface layer and the upper part of the subsoil than the major soils; on backslopes

• The somewhat excessively drained Thurman soils, which contain more sand and less clay in the subsoil than the major soils; on summits and shoulders

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Fairly well suited

Management concerns: Wind erosion, water erosion, the restricted available water capacity, and agrochemical leaching
Management considerations:
• These soils are better suited to early maturing crops, such as small grain, than to some other crops. Minimizing tillage, leaving crop residue on the surface, and including grasses and legumes in the cropping system help to control erosion, conserve moisture, and help to maintain the content of organic matter.
• Wind stripcropping and field windbreaks help to control wind erosion.
• Applying nitrogen close to the time when crops will use it reduces the amount of time available for leaching.

Interpretive Groups

Land capability classification: Blendon—3e; Henkin—3e
Range site: Blendon—Sandy; Henkin—Sandy
Windbreak suitability group: Blendon—5; Henkin—5
Pasture suitability group: Blendon—H; Henkin—H

Bo—Bon loam, 0 to 2 percent slopes

Composition

Bon and similar soils: 80 to 95 percent
Contrasting inclusions: 5 to 20 percent

Setting

Landform: High flood plains
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 10 to 100 acres

Typical Profile

Surface layer:
0 to 9 inches—dark gray, calcareous loam

Subsoil:
9 to 39 inches—dark gray, calcareous loam

Underlying layer:
39 to 78 inches—dark gray, dark grayish brown, and grayish brown, calcareous loam and stratified loamy fine sand and fine sandy loam; redoximorphic concentrations in the lower part
78 to 80 inches—dark grayish brown, calcareous loam

Soil Properties and Qualities

Drainage class: Moderately well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
Depth to high water table: 3 to 5 feet
Flooding: Occasional for brief periods
Ponding: None
Permeability: Moderate
Available water capacity: High
Content of organic matter: High
Surface runoff class: Low

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Chaska soils on low flood plains
• The somewhat poorly drained Lamo soils, which have more silt and less sand than the Bon soil; on low flood plains
• The moderately well drained Janude soils, which have less clay than the Bon soil; on high flood plains

Similar inclusions:
• Soils that do not have lime in the upper 20 inches

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Few limitations
Management considerations:
• Managing crop residue conserves moisture and helps to maintain tilth and the content of organic matter.

Interpretive Groups

Land capability classification: 1
Range site: Loamy Overflow
Windbreak suitability group: 1
Pasture suitability group: K

Cb—Chancellor silty clay loam, 0 to 1 percent slopes

Composition

Chancellor and similar soils: 75 to 90 percent
Contrasting inclusions: 10 to 25 percent

Setting

Landform: Till plains
Position on the landform: Toeslopes
Slope range: 0 to 1 percent
Shape of areas: Elongated
Size of areas: 10 to 60 acres

Typical Profile

Surface soil:
0 to 12 inches—very dark gray silty clay loam

Subsoil:
12 to 17 inches—very dark gray silty clay
17 to 23 inches—dark gray silty clay
23 to 31 inches—dark gray silty clay that has redoximorphic concentrations
31 to 47 inches—gray, calcareous silty clay loam that has redoximorphic concentrations

Underlying layer:
47 to 80 inches—light brownish gray, calcareous silty clay loam that has redoximorphic concentrations

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
High water table: At the surface to 2 feet below the surface
Flooding: Frequent for brief periods
Ponding: None
Permeability: Slow
Available water capacity: High
Content of organic matter: High
Surface runoff class: Very low
Other properties: Runoff water flows over this soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
• The poorly drained Clamo soils, which have lime within a depth of 30 inches; on low flood plains
• The poorly drained, saline Salmo soils on low flood plains
• The poorly drained Tetonka soils in small basins
• The moderately well drained Trent and Wakonda soils on footslopes

Similar inclusions:
• Soils that have less clay in the subsoil than the Chancellor soil
• Soil that have more sand in the subsoil than the Chancellor soil

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Flooding, high water table, and a slow rate of water infiltration
Management considerations:
• This soil is better suited to late-planted crops than to some other crops.
• Deferring tillage when the soil is wet helps to prevent soil compaction.
• Practices that reduce runoff from adjacent soils help to control wetness.
• Maintaining existing drainage systems helps to remove excess water.

Interpretive Groups

Land capability classification: 2w
Range site: Loamy Overflow
Windbreak suitability group: 2
Pasture suitability group: A

Cc—Chancellor-Tetonka complex, 0 to 1 percent slopes

Composition

Chancellor and similar soils: 40 to 60 percent
Tetonka and similar soils: 25 to 35 percent
Contrasting inclusions: 5 to 25 percent

Setting

Landform: Till plains
Position on the landform: Chancellor—toeslopes; Tetonka—basins
Slope range: 0 to 1 percent
Shape of areas: Elongated
Size of areas: 10 to 60 acres

Typical Profile

Chancellor

Surface soil:
0 to 12 inches—very dark gray silty clay loam

Subsoil:
12 to 17 inches—very dark gray silty clay
17 to 23 inches—dark gray silty clay
23 to 31 inches—dark gray silty clay that has redoximorphic concentrations
31 to 47 inches—gray, calcareous silty clay loam that has redoximorphic concentrations

Underlying layer:
47 to 80 inches—light brownish gray, calcareous silty clay loam that has redoximorphic concentrations

Tetonka

Surface layer:
0 to 7 inches—dark gray silt loam

Subsurface layer:
7 to 16 inches—gray silt loam that has redoximorphic concentrations

Transitional layer:
16 to 20 inches—gray silt loam and silty clay that have redoximorphic concentrations

Subsoil:
20 to 45 inches—gray silty clay that has redoximorphic concentrations
45 to 60 inches—light brownish gray silty clay that has redoximorphic concentrations and depletions

Underlying layer:
60 to 80 inches—light brownish gray clay loam that has redoximorphic concentrations and depletions

Soil Properties and Qualities

Drainage class: Chancellor—somewhat poorly drained; Tetonka—poorly drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
High water table: Chancellor—at the surface to 2 feet below the surface; Tetonka—1 foot above to 1 foot below the surface
Flooding: Chancellor—frequent for brief periods; Tetonka—none
Ponding: Chancellor—none; Tetonka—frequent for long periods
Permeability: Slow
Available water capacity: High
Content of organic matter: High
Surface runoff class: Chancellor—very low; Tetonka—negligible
Other properties: Runoff water flows over the Chancellor soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
• The poorly drained, saline Salmo soils on low flood plains
• The moderately well drained Trent soils, which have less clay in the subsoil than the major soils; on footslopes
• The very poorly drained Worthing soils in basins
• The moderately well drained Wakonda soils, which are calcareous at the surface; on footslopes

Similar inclusions:
• Soils that have less clay in the subsoil
• Soils that have more sand in the subsoil

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Fairly well suited
Management concerns: Chancellor—flooding, high water table; Tetonka—ponding, high water table
Management considerations:
• These soils are better suited to late-planted crops than to some other crops.
• Deferring tillage when the soils are wet helps to prevent soil compaction.
• Practices that reduce runoff from adjacent soils help to control wetness.
• Maintaining existing drainage systems helps to remove excess water.

Interpretive Groups

Land capability classification: Chancellor—2w; Tetonka—4w
Range site: Chancellor—Loamy Overflow; Tetonka—Wet Meadow
Windbreak suitability group: Chancellor—2; Tetonka—10
Pasture suitability group: Chancellor—A; Tetonka—B2

Cd—Chaska loam, 0 to 2 percent slopes

Composition

Chaska and similar soils: 75 to 85 percent
Contrasting inclusions: 15 to 25 percent

Setting

Landform: Low flood plains
Slope range: 0 to 2 percent
Shape of areas: Elongated
Size of areas: 10 to 40 acres

Typical Profile

Surface layer:
0 to 6 inches—dark grayish brown, calcareous, stratified loam

Underlying layer:
6 to 72 inches—gray, light gray, dark gray, and light brownish gray, calcareous loam, stratified loam, and loamy fine sand
72 to 80 inches—dark gray and light brownish

gray, calcareous loam and stratified loamy fine sand with redoximorphic concentrations

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
Depth to high water table: 0.5 foot to 1.5 feet
Flooding: Occasional for brief periods
Ponding: None
Permeability: Moderate
Available water capacity: High
Content of organic matter: Moderate
Surface runoff class: Low
Other properties: This soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The very poorly drained Baltic soils, which contain more clay in the subsoil than the Chaska soil; on low flood plains and in basins
• The moderately well drained Bon soils, which do not have a stratified surface layer or subsoil; on high flood plains
• The somewhat poorly drained Lamo soils, which have more silt and less sand than the Chaska soil; on low flood plains

Similar inclusions:
• Soils that do not have stratification in the upper 10 inches

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Flooding, high water table, wind erosion, and the high content of lime, which adversely affects the availability of plant nutrients
Management considerations:
• Leaving crop residue on the surface and deferring tillage when the soil is wet help to maintain tilth and control erosion.
• Including grasses and legumes in the rotation helps to control erosion and helps to maintain the content of organic matter, fertility, and tilth.
• Maintaining existing drainage systems helps to remove excess water.

Interpretive Groups

Land capability classification: 2w
Range site: Subirrigated
Windbreak suitability group: 1K
Pasture suitability group: A

Ch—Chaska loam, channeled

Composition

Chaska and similar soils: 70 to 80 percent
Contrasting inclusions: 20 to 30 percent

Setting

Landform: Low flood plains
Slope range: 0 to 2 percent
Shape of areas: Long and narrow
Size of areas: 15 to 300 acres

Typical Profile

Surface layer:
0 to 6 inches—dark grayish brown, calcareous, stratified loam

Underlying layer:
6 to 72 inches—gray, light gray, dark gray, and light brownish gray, calcareous loam, stratified loam, and loamy fine sand
72 to 80 inches—dark gray and light brownish gray, calcareous loam and stratified loamy fine sand with redoximorphic concentrations

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
Depth to high water table: 1.5 to 2.5 feet
Flooding: Frequent for long periods
Ponding: None
Permeability: Moderate
Available water capacity: High
Content of organic matter: Moderate
Surface runoff class: Low
Other properties: This soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The moderately well drained Bon soils, which do not have a stratified surface layer or subsoil; on high flood plains
• The moderately well drained Davis soils on high flood plains
• The somewhat poorly drained Dimo soils, which have gravelly material within a depth of 40 inches; on high flood plains

• The somewhat poorly drained Lamo soils, which have more silt and less sand than the Chaska soil; on low flood plains

Similar inclusions:
• Soils that do not have stratification in the upper 10 inches

Use and Management

Rangeland

Suitability for crops: Generally unsuited
Management concerns: Flooding, high water table, wind erosion, the high content of lime (which adversely affects the availability of plant nutrients), and meandering channels (which limit cultivation)
Management considerations:
• Proper grazing management helps to maintain plant vigor and helps to control streambank erosion and wind erosion.
• Cultivated areas should be seeded to adapted grasses.

Interpretive Groups

Land capability classification: 6w
Range site: Subirrigated
Windbreak suitability group: 1K
Pasture suitability group: NS

Cm—Clamo silty clay, 0 to 1 percent slopes

Composition

Clamo and similar soils: 85 to 99 percent
Contrasting inclusions: 1 to 15 percent

Setting

Landform: Low flood plains
Slope range: 0 to 1 percent
Shape of areas: Elongated
Size of areas: 15 to 1,600 acres

Typical Profile

Surface layer:
0 to 8 inches—very dark gray silty clay

Subsoil:
8 to 19 inches—very dark gray silty clay
19 to 25 inches—dark gray, calcareous silty clay
25 to 51 inches—grayish brown, calcareous silty clay that has redoximorphic concentrations
51 to 60 inches—light brownish gray, calcareous silty clay loam that has redoximorphic concentrations

Underlying layer:
60 to 80 inches—grayish brown, calcareous silty clay loam that has redoximorphic concentrations

Soil Properties and Qualities

Drainage class: Poorly drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 40 inches over sandy material
Depth to high water table: 0.5 foot to 1.5 feet
Flooding: Occasional for long periods
Ponding: None
Permeability: Slow
Available water capacity: High
Content of organic matter: High
Surface runoff class: Very low

Inclusions

Contrasting inclusions:
• The moderately well drained Alcester soils, which contain less clay than the Clamo soil; on high flood plains
• The somewhat poorly drained Lamo soils, which contain less clay than the Clamo soil; on low flood plains

Similar inclusions:
• Soils that do not have lime within a depth of 30 inches
• Soils that have lime within a depth of 14 inches

Use and Management

Cropland and pasture

Main crops: Corn, oats, soybeans (fig. 7), and spring wheat
Suitability for crops: Poorly suited
Management concerns: Flooding, high water table, the high content of lime (which adversely affects the availability of plant nutrients), a slow rate of water infiltration, soil compaction (if tilled during wet periods), and wind erosion
Management considerations:
• In wet years this soil is better suited to late-planted crops than to some other crops.
• Deferring tillage when the soil is wet helps to maintain tilth and minimizes soil compaction.
• Wind stripcropping and field windbreaks help to control wind erosion.
• Maintaining existing drainage systems helps to remove excess water.
• Permanent pasture or hayland species should be established.

Figure 7.—Soybeans in an area of Clamo silty clay, 0 to 1 percent slopes.

Interpretive Groups

Land capability classification: 4w
Range site: Wetland
Windbreak suitability group: 10
Pasture suitability group: B1

CoB—Corson silty clay, 2 to 6 percent slopes

Composition

Corson and similar soils: 75 to 85 percent
Contrasting inclusions: 15 to 25 percent

Setting

Landform: Terraces
Position on the landform: Backslopes
Slope range: 2 to 6 percent
Shape of areas: Elongated or irregular
Size of areas: 10 to 100 acres

Typical Profile

Surface layer:
0 to 6 inches—dark gray silty clay

Subsoil:
6 to 16 inches—dark gray silty clay
16 to 25 inches—grayish brown, calcareous silty clay
25 to 39 inches—light brownish gray, calcareous silty clay
39 to 49 inches—light brownish gray, calcareous silty clay that has redoximorphic concentrations

Underlying layer:
49 to 80 inches—light brownish gray, calcareous silty clay that has redoximorphic concentrations

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep

Depth to contrasting parent material: More than 60 inches
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Slow
Available water capacity: High
Content of organic matter: Moderate
Surface runoff class: High

Inclusions

Contrasting inclusions:
- The moderately well drained Benclare soils on footslopes
- The somewhat poorly drained Chancellor soils on toeslopes
- The well drained Moody soils, which have less clay than the Corson soil; on summits and backslopes

Similar inclusions:
- Soils that have lime within a depth of 10 inches

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Fairly well suited
Management concerns: Water erosion, wind erosion, and a slow rate of water infiltration
Management considerations:
- Leaving crop residue on the surface, minimizing tillage, tilling in a timely manner, and including grasses and legumes in the cropping system help to control erosion, conserve moisture, and help to maintain tilth and the content of organic matter.
- Contour farming and grassed waterways help to control water erosion, but slopes in most areas are too short or too irregular for farming on the contour.
- Chiseling or subsoiling when the soil is dry increases the rate of water infiltration.

Interpretive Groups

Land capability classification: 3e
Range site: Clayey
Windbreak suitability group: 4C
Pasture suitability group: E

CoC—Corson silty clay, 6 to 9 percent slopes

Composition

Corson and similar soils: 75 to 85 percent
Contrasting inclusions: 15 to 25 percent

Setting

Landform: Terraces
Position on the landform: Backslopes
Slope range: 6 to 9 percent
Shape of areas: Irregular
Size of areas: 10 to 100 acres

Typical Profile

Surface layer:
0 to 6 inches—dark gray silty clay

Subsoil:
6 to 16 inches—dark gray silty clay
16 to 25 inches—grayish brown, calcareous silty clay
25 to 39 inches—light brownish gray, calcareous silty clay
39 to 49 inches—light brownish gray, calcareous silty clay that has redoximorphic concentrations

Underlying layer:
49 to 80 inches—light brownish gray, calcareous silty clay that has redoximorphic concentrations

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Slow
Available water capacity: High
Content of organic matter: Moderate
Surface runoff class: High

Inclusions

Contrasting inclusions:
- The moderately well drained Benclare soils on footslopes
- The somewhat poorly drained Chancellor soils on toeslopes
- The well drained Houdek and Moody soils, which have less clay than the Corson soil; on backslopes
- The well drained Shindler soils, which have less clay and more sand than the Corson soil; on shoulders

Similar inclusions:
- Soils that have lime within a depth of 10 inches

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat

Suitability for crops: Fairly well suited
Management concerns: Water erosion, wind erosion, and a slow rate of water infiltration
Management considerations:
• Leaving crop residue on the surface, minimizing tillage, tilling in a timely manner, and including grasses and legumes in the cropping system help to control erosion, conserve moisture, and help to maintain tilth and the content of organic matter.
• Contour farming, terraces, and grassed waterways help to control water erosion, but slopes in most areas are too short or too irregular for contour farming or terraces.
• Chiseling or subsoiling when the soil is dry increases the rate of water infiltration.

Interpretive Groups

Land capability classification: 3e
Range site: Clayey
Windbreak suitability group: 4C
Pasture suitability group: E

CpC—Corson-Henkin complex, 6 to 9 percent slopes

Composition

Corson and similar soils: 45 to 70 percent
Henkin and similar soils: 15 to 35 percent
Contrasting inclusions: 10 to 30 percent

Setting

Landform: Terraces and outwash plains
Position on the landform: Shoulders and backslopes
Slope range: 6 to 9 percent
Shape of areas: Long and narrow
Size of areas: 5 to 50 acres

Typical Profile

Corson

Surface layer:
0 to 8 inches—dark gray, calcareous silty clay

Subsoil:
8 to 14 inches—dark gray, calcareous silty clay
14 to 30 inches—light brownish gray, calcareous silty clay

Underlying layer:
30 to 51 inches—light brownish gray, calcareous silty clay that has redoximorphic concentrations
51 to 80 inches—pale yellow, calcareous silty clay loam that has redoximorphic concentrations and depletions

Henkin

Surface layer:
0 to 9 inches—dark grayish brown fine sandy loam

Subsoil:
9 to 25 inches—brown fine sandy loam
25 to 46 inches—pale brown, calcareous fine sandy loam

Underlying layer:
46 to 59 inches—light yellowish brown, calcareous fine sandy loam
59 to 80 inches—light yellowish brown, calcareous fine sandy loam that has redoximorphic depletions in the upper part and redoximorphic concentrations and depletions in the lower part

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: Corson—more than 60 inches; Henkin—more than 40 inches over loamy glacial till or gravelly material
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Corson—slow; Henkin—moderately rapid
Available water capacity: Corson—high; Henkin—moderate
Content of organic matter: Corson—moderate; Henkin—moderately low
Surface runoff class: Corson—high; Henkin—medium
Other properties: This map unit occurs as a terrace escarpment near Beaver Creek and lower Splitrock Creek. It typically includes an area with short steep slopes that is too small to map separately.

Inclusions

Contrasting inclusions:
• The moderately well drained Benclare soils on footslopes
• The somewhat poorly drained Chancellor soils on toeslopes
• The well drained Grovena and Shindler soils, which have less clay than the Corson soil and more clay than the Henkin soil; on shoulders and backslopes
• The somewhat excessively drained Thurman soils, which contain more sand and less clay in the subsoil than the major soils; on summits and shoulders

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Fairly well suited
Management concerns: Corson—wind erosion, water erosion, and a slow rate of water infiltration; Henkin—wind erosion, water erosion, the restricted available water capacity, and agrochemical leaching
Management considerations:
• Leaving crop residue on the surface, minimizing tillage, tilling in a timely manner, and including grasses and legumes in the cropping system help to control erosion, conserve moisture, and help to maintain the content of organic matter, fertility, and tilth.
• Contour farming, terraces, and grassed waterways help to control water erosion, but slopes in most areas are too short or too irregular for contour farming or terraces.
• Wind stripcropping and field windbreaks help to control wind erosion.
• Applying nitrogen close to the time when crops will use it reduces the amount of time available for leaching.

Interpretive Groups

Land capability classification: Corson—3e; Henkin—4e
Range site: Corson—Clayey; Henkin—Sandy
Windbreak suitability group: Corson—4C; Henkin—5
Pasture suitability group: Corson—E; Henkin—H

CrD—Crofton-Nora complex, 9 to 15 percent slopes

Composition

Crofton and similar soils: 35 to 50 percent
Nora and similar soils: 30 to 50 percent
Contrasting inclusions: 5 to 25 percent

Setting

Landform: Dissected plains
Position on the landform: Crofton—shoulders; Nora—backslopes
Slope range: 9 to 15 percent
Shape of areas: Irregular
Size of areas: 20 to 200 acres

Typical Profile

Crofton

Surface layer:
0 to 6 inches—light brownish gray, calcareous silt loam

Transitional layer:
6 to 14 inches—pale brown, calcareous silt loam

Underlying layer:
14 to 40 inches—light yellowish brown, calcareous silt loam that has relict redoximorphic features
40 to 80 inches—very pale brown, calcareous silt loam that has relict redoximorphic features

Nora

Surface layer:
0 to 9 inches—grayish brown silty clay loam

Subsoil:
9 to 22 inches—pale brown silty clay loam
22 to 32 inches—pale brown, calcareous silt loam
32 to 54 inches—pale brown, calcareous silt loam that has relict redoximorphic features

Underlying layer:
54 to 80 inches—light yellowish brown, calcareous silt loam that has redoximorphic concentrations and depletions

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: Crofton—more than 60 inches; Nora—more than 40 inches over loamy glacial till or sandy material
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderate
Available water capacity: High
Content of organic matter: Crofton—low; Nora—moderate
Surface runoff class: High
Other properties: The Crofton soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The moderately well drained Trent soils on footslopes
• The somewhat poorly drained Whitewood soils on toeslopes

Similar inclusions:
• Soils that do not have lime within a depth of 30 inches

Use and Management

Cropland and pasture

Main crops: Nora—alfalfa, barley, corn, oats, and spring wheat

Suitability for crops: Generally unsuited
Management concerns: Crofton—wind erosion, water erosion, and the high content of lime, which adversely affects the availability of plant nutrients; Nora—water erosion
Management considerations:
• Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion.
• Contour farming, terraces, and grassed waterways help to control water erosion, but slopes in some areas are too short or too irregular for contour farming or terraces.
• Wind stripcropping and field windbreaks help to control wind erosion.
• Including grasses and legumes in the rotation helps to control erosion and helps to maintain the content of organic matter, fertility, and tilth.
• Establishing permanent pasture or hayland species helps to control erosion.
• Proper grazing management helps to maintain plant vigor and control erosion.

Interpretive Groups

Land capability classification: Crofton—6e; Nora—4e
Range site: Crofton—Thin Upland; Nora—Silty
Windbreak suitability group: Crofton—8; Nora—3
Pasture suitability group: Crofton—G; Nora—F

CrE—Crofton-Nora complex, 15 to 25 percent slopes

Composition

Crofton and similar soils: 45 to 70 percent
Nora and similar soils: 25 to 50 percent
Contrasting inclusions: 1 to 20 percent

Setting

Landform: Dissected plains
Position on the landform: Crofton—shoulders; Nora—backslopes
Slope range: 15 to 25 percent
Shape of areas: Elongated or irregular
Size of areas: 10 to 50 acres

Typical Profile

Crofton

Surface layer:
0 to 6 inches—light brownish gray, calcareous silt loam

Transitional layer:
6 to 14 inches—pale brown, calcareous silt loam

Underlying layer:
14 to 40 inches—light yellowish brown, calcareous silt loam that has relict redoximorphic features
40 to 80 inches—very pale brown, calcareous silt loam that has relict redoximorphic features

Nora

Surface layer:
0 to 9 inches—grayish brown silty clay loam

Subsoil:
9 to 22 inches—pale brown silty clay loam
22 to 32 inches—pale brown, calcareous silt loam
32 to 54 inches—pale brown, calcareous silt loam that has relict redoximorphic features

Underlying layer:
54 to 80 inches—light yellowish brown, calcareous silt loam that has redoximorphic concentrations and depletions

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: Crofton—more than 60 inches; Nora—more than 40 inches over loamy glacial till or sandy material
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderate
Available water capacity: High
Content of organic matter: Crofton—low; Nora—moderate
Surface runoff class: High
Other properties: The Crofton soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The well drained Ihlen soils, which have unweathered bedrock within a depth of 40 inches; on backslopes and footslopes
• The well drained Shindler soils, which have less silt and more sand than the major soils; on shoulders
• The moderately well drained Trent soils on footslopes
• The somewhat poorly drained Whitewood soils on toeslopes

Similar inclusions:
• Soils that do not have lime within a depth of 30 inches

Use and Management

Rangeland

Suitability for crops: Generally unsuited
Management concerns: Crofton—wind erosion, water erosion, and the high content of lime, which adversely affects the availability of plant nutrients; Nora—water erosion
Management considerations:
• Proper grazing management helps to maintain plant vigor, conserves moisture, and helps to control erosion.

Interpretive Groups

Land capability classification: Crofton—6e; Nora—6e
Range site: Crofton—Thin Upland; Nora—Silty
Windbreak suitability group: Crofton—10; Nora—10
Pasture suitability group: Crofton—NS; Nora—NS

CsD—Crofton-Shindler complex, 9 to 15 percent slopes

Composition

Crofton and similar soils: 45 to 60 percent
Shindler and similar soils: 15 to 35 percent
Contrasting inclusions: 10 to 25 percent

Setting

Landform: Dissected plains
Position on the landform: Crofton—shoulders; Shindler—backslopes
Slope range: 9 to 15 percent
Shape of areas: Elongated or irregular
Size of areas: 10 to 100 acres

Typical Profile

Crofton

Surface layer:
0 to 6 inches—light brownish gray, calcareous silt loam

Transitional layer:
6 to 14 inches—pale brown, calcareous silt loam

Underlying layer:
14 to 40 inches—light yellowish brown, calcareous silt loam that has relict redoximorphic features
40 to 80 inches—very pale brown, calcareous silt loam that has relict redoximorphic features

Shindler

Surface layer:
0 to 8 inches—dark gray, calcareous clay loam

Subsoil:
8 to 14 inches—gray and light yellowish brown, calcareous clay loam
14 to 59 inches—light yellowish brown, calcareous clay loam that has relict redoximorphic features

Underlying layer:
59 to 80 inches—pale yellow, calcareous clay loam that has relict redoximorphic features

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Crofton—moderate; Shindler—moderately slow
Available water capacity: High
Content of organic matter: Crofton—low; Shindler—moderately low
Surface runoff class: Crofton—high; Shindler—very high
Other properties: Both soils have a high content of lime.

Inclusions

Contrasting inclusions:
• The well drained Davis soils, which have dark colors extending to a depth of more than 20 inches; on footslopes
• The well drained Flandreau and Moody soils, which do not have lime in the upper 25 inches; on backslopes
• The well drained Nora soils, which do not have lime in the upper 13 inches; on backslopes
• The somewhat poorly drained Whitewood soils on toeslopes

Similar inclusions:
• Soils that do not have lime below a depth of 8 inches

Use and Management

Rangeland and pasture

Suitability for crops: Generally unsuited
Management concerns: Wind erosion, water erosion, and the high content of lime, which adversely affects the availability of plant nutrients
Management considerations:
• Establishing permanent pasture or hayland species helps to control erosion.

• Proper grazing management helps to maintain plant vigor and control erosion.
• If areas of this map unit are used for crops, minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion. Contour farming, terraces, and grassed waterways help to control water erosion, but slopes in some areas are too short or too irregular for contour farming or terraces.
• Including grasses and legumes in the rotation helps to control erosion and helps to maintain tilth and the content of organic matter.

Interpretive Groups

Land capability classification: Crofton—6e; Shindler—6e
Range site: Crofton—Thin Upland; Shindler—Silty
Windbreak suitability group: Crofton—8; Shindler—8
Pasture suitability group: Crofton—G; Shindler—G

DcA—Davis loam, 0 to 2 percent slopes

Composition

Davis and similar soils: 80 to 95 percent
Contrasting inclusions: 5 to 20 percent

Setting

Landform: High flood plains
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 10 to 100 acres

Typical Profile

Surface layer:
0 to 8 inches—dark gray loam

Transitional layer:
8 to 16 inches—dark gray loam

Subsoil:
16 to 23 inches—dark grayish brown silt loam
23 to 47 inches—grayish brown loam
47 to 80 inches—grayish brown, calcareous loam

Soil Properties and Qualities

Drainage class: Moderately well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
Depth to high water table: 3 to 5 feet
Frequency of flooding: Rare
Ponding: None
Permeability: Moderate
Available water capacity: High
Content of organic matter: High
Surface runoff class: Low
Other properties: Runoff water flows over this soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Chaska soils on low flood plains
• The poorly drained Clamo soils, which have more clay than the Davis soil; on low flood plains
• The moderately well drained Janude soils, which have less clay than the Davis soil; on high flood plains

Similar inclusions:
• Soils that contain less sand and more silt than the Davis soil
• Soils that contain less clay than the Davis soil

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Few limitations
Management considerations:
• Managing crop residue conserves moisture and helps to maintain tilth and the content of organic matter.

Interpretive Groups

Land capability classification: 1
Range site: Loamy Overflow
Windbreak suitability group: 1
Pasture suitability group: K

DcB—Davis loam, 2 to 6 percent slopes

Composition

Davis and similar soils: 75 to 95 percent
Contrasting inclusions: 5 to 25 percent

Setting

Landform: Fans
Position on the landform: Footslopes
Slope range: 2 to 6 percent
Shape of areas: Irregular
Size of areas: 10 to 100 acres

Typical Profile

Surface layer:
0 to 8 inches—dark gray loam

Transitional layer:
8 to 16 inches—dark gray loam

Subsoil:
16 to 23 inches—dark grayish brown silt loam
23 to 47 inches—grayish brown loam
47 to 80 inches—grayish brown, calcareous loam

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderate
Available water capacity: High
Content of organic matter: High
Surface runoff class: Medium
Other properties: Runoff water flows over this soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
• The well drained Blendon soils, which have less clay than the Davis soil; on footslopes
• The somewhat poorly drained Chaska soils on low flood plains
• The well drained Henkin soils, which have less clay than the Davis soil; on backslopes

Similar inclusions:
• Soils that have lime above a depth of 20 inches
• Soils that contain less sand and more silt than the Davis soil

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Water erosion
Management considerations:
• Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture.
• Contour farming and grassed waterways help to control water erosion.
• Including grasses and legumes in the rotation helps to control erosion and helps to maintain tilth and the content of organic matter.

Interpretive Groups

Land capability classification: 2e
Range site: Silty
Windbreak suitability group: 3
Pasture suitability group: F

DcC—Davis loam, 6 to 9 percent slopes

Composition

Davis and similar soils: 75 to 95 percent
Contrasting inclusions: 5 to 25 percent

Setting

Landform: Fans
Position on the landform: Footslopes
Slope range: 6 to 9 percent
Shape of areas: Irregular
Size of areas: 10 to 50 acres

Typical Profile

Surface layer:
0 to 8 inches—dark gray loam

Transitional layer:
8 to 16 inches—dark gray loam

Subsoil:
16 to 23 inches—dark grayish brown silt loam
23 to 47 inches—grayish brown loam
47 to 80 inches—grayish brown, calcareous loam

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderate
Available water capacity: High
Content of organic matter: High
Surface runoff class: Medium
Other properties: Runoff water flows over this soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
• The well drained Blendon soils, which have less clay than the Davis soil; on footslopes
• The somewhat poorly drained Chaska soils on low flood plains
• The well drained Grovena soils, which are dark to a depth of less than 20 inches; on backslopes
• The well drained Henkin soils, which have less clay than the Davis soil; on backslopes

Similar inclusions:
- Soils that have lime above a depth of 20 inches
- Soils that contain less sand and more silt than the Davis soil

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Fairly well suited
Management concerns: Water erosion
Management considerations:
- Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture.
- Contour farming and grassed waterways help to control water erosion.
- Including grasses and legumes in the rotation helps to control erosion and helps to maintain tilth and the content of organic matter.

Interpretive Groups

Land capability classification: 3e
Range site: Silty
Windbreak suitability group: 3
Pasture suitability group: F

Dd—Davison-Crossplain clay loams, 0 to 2 percent slopes

Composition

Davison and similar soils: 30 to 55 percent
Crossplain and similar soils: 25 to 55 percent
Contrasting inclusions: 10 to 25 percent

Setting

Landform: Till plains
Position on the landform: Davison—backslopes and footslopes; Crossplain—toeslopes
Slope range: Davison—0 to 2 percent; Crossplain—0 to 1 percent
Shape of areas: Irregular or elongated
Size of areas: 5 to 70 acres

Typical Profile

Davison

Surface layer:
0 to 8 inches—dark gray, calcareous clay loam

Subsoil:
8 to 22 inches—light yellowish brown, calcareous clay loam that has redoximorphic concentrations
22 to 41 inches—light yellowish brown, calcareous clay loam that has redoximorphic concentrations and depletions

Underlying layer:
41 to 54 inches—light olive brown, calcareous clay loam that has redoximorphic concentrations and depletions
54 to 80 inches—light yellowish brown and pale yellow, calcareous clay loam that has redoximorphic concentrations and depletions

Crossplain

Surface layer:
0 to 8 inches—very dark gray clay loam

Subsoil:
8 to 16 inches—very dark gray clay loam
16 to 24 inches—dark gray clay that has redoximorphic concentrations
24 to 42 inches—light brownish gray, calcareous clay loam that has redoximorphic concentrations and depletions

Underlying layer:
42 to 80 inches—light brownish gray, calcareous clay loam that has redoximorphic concentrations and depletions

Soil Properties and Qualities

Drainage class: Davison—moderately well drained; Crossplain—somewhat poorly drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
High water table: Davison—at a depth of 1.5 to 4.0 feet; Crossplain—at the surface to 2 feet below the surface
Flooding: Davison—none; Crossplain—frequent for brief periods
Ponding: None
Permeability: Davison—moderate; Crossplain—slow
Available water capacity: High
Content of organic matter: Davison—moderate; Crossplain—high
Surface runoff class: Low
Other properties: Runoff water flows over the Crossplain soil during periods of rainfall or snowmelt. The Davison soil has a high content of lime.

Inclusions

Contrasting inclusions:
- The well drained Ethan soils on shoulders
- The moderately well drained Trent soils, which are dark to a depth of more than 20 inches; on footslopes
- The well drained Wentworth soils on summits

- The poorly drained Tetonka soils in small basins
- The very poorly drained Worthing soils in basins

Similar inclusions:
- Soils that contain more silt and less sand than the Davison soil
- Soils that contain less sand than the Crossplain soil

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Davison—the high content of lime (which adversely affects the availability of plant nutrients) and wind erosion; Crossplain—flooding, high water table
Management considerations:
- Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture.
- Including grasses and legumes in the rotation helps to control erosion and helps to maintain the content of organic matter, fertility, and tilth.
- Maintaining existing drainage systems helps to remove excess water in areas of the Crossplain soil. Practices that reduce runoff from adjacent soils help to control wetness.
- Deferring tillage when the soils are wet helps to prevent soil compaction.

Interpretive Groups

Land capability classification: Davison—2s; Crossplain—2w
Range site: Davison—Limy Subirrigated; Crossplain—Loamy Overflow
Windbreak suitability group: Davison—1K; Crossplain—2
Pasture suitability group: Davison—F; Crossplain—A

DeA—Delmont-Enet loams, 0 to 2 percent slopes

Composition

Delmont and similar soils: 35 to 55 percent
Enet and similar soils: 25 to 40 percent
Contrasting inclusions: 5 to 25 percent

Setting

Landform: Outwash plains
Position on the landform: Delmont—summits and shoulders; Enet—backslopes and footslopes
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 10 to 50 acres

Typical Profile

Delmont

Surface layer:
0 to 8 inches—very dark gray loam

Subsoil:
8 to 15 inches—very dark gray loam

Underlying layer:
15 to 73 inches—grayish brown and light brownish gray, calcareous gravelly loamy sand and gravelly sand
73 to 80 inches—light gray, calcareous sand

Enet

Surface layer:
0 to 7 inches—very dark gray loam

Subsoil:
7 to 23 inches—very dark gray loam
23 to 28 inches—brown sandy loam

Underlying layer:
28 to 80 inches—light yellowish brown, calcareous gravelly sand

Soil Properties and Qualities

Drainage class: Delmont—somewhat excessively drained; Enet—well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: Delmont—14 to 20 inches over gravelly material; Enet—20 to 40 inches over gravelly material
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderate in the loamy sediments and very rapid in the underlying gravelly material
Available water capacity: Delmont—low; Enet—moderate
Content of organic matter: Moderate
Surface runoff class: Low
Other properties: Runoff water flows over the Enet soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
- The poorly drained Arlo soils on low flood plains
- The well drained Davis soils, which do not have gravelly material within a depth of 40 inches; on footslopes
- The well drained Flandreau soils, which grade to sandy material within a depth of 40 inches, do not have gravelly material, and have loamy glacial till below a depth of 40 inches; on summits and backslopes

Similar inclusions:
• Soils that contain less sand in the subsoil than the Delmont soil
• Soils that contain less sand in the subsoil than the Enet soil
• Soils that have sand and gravel at a depth of 40 to 60 inches

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Fairly well suited
Management concerns: The restricted available water capacity; agrochemical leaching
Management considerations:
• These soils are better suited to early maturing crops, such as small grain, than to some other crops. Minimizing tillage and leaving crop residue on the surface conserve moisture.
• Including grasses and legumes in the rotation helps to control erosion and helps to maintain tilth and the content of organic matter.
• Irrigation helps to overcome the limited ability of the soils to store water if an adequate and dependable supply of water is available.
• Applying nitrogen close to the time when crops will use it reduces the amount of time available for leaching.

Interpretive Groups

Land capability classification: Delmont—3s; Enet—2s
Range site: Delmont—Shallow to Gravel; Enet—Silty
Windbreak suitability group: Delmont—6G; Enet—6G
Pasture suitability group: Delmont—D2; Enet—D1

DeB—Delmont-Enet loams, 2 to 6 percent slopes

Composition

Delmont and similar soils: 30 to 55 percent
Enet and similar soils: 30 to 55 percent
Contrasting inclusions: 10 to 25 percent

Setting

Landform: Outwash plains
Position on the landform: Delmont—summits and shoulders; Enet—backslopes and footslopes
Slope range: 2 to 6 percent
Shape of areas: Irregular
Size of areas: 10 to 500 acres

Typical Profile

Delmont

Surface layer:
0 to 8 inches—very dark gray loam

Subsoil:
8 to 15 inches—very dark gray loam

Underlying layer:
15 to 73 inches—grayish brown and light brownish gray, calcareous gravelly loamy sand and gravelly sand
73 to 80 inches—light gray, calcareous sand

Enet

Surface layer:
0 to 7 inches—very dark gray loam

Subsoil:
7 to 23 inches—very dark gray loam
23 to 28 inches—brown sandy loam

Underlying layer:
28 to 80 inches—light yellowish brown, calcareous gravelly sand

Soil Properties and Qualities

Drainage class: Delmont—somewhat excessively drained; Enet—well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: Delmont—14 to 20 inches over gravelly material; Enet—20 to 40 inches over gravelly material
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderate in the loamy sediments and very rapid in the underlying gravelly material
Available water capacity: Delmont—low; Enet—moderate
Content of organic matter: Moderate
Surface runoff class: Medium
Other properties: Runoff water flows over the Enet soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Chancellor soils on toeslopes
• The well drained Davis soils, which do not have gravelly material within a depth of 40 inches; on footslopes
• The well drained Egan and Nora soils, which have more silt in the subsoil than the major soils and do not

have gravelly material within a depth of 40 inches; on backslopes
- The excessively drained Talmo soils, which have gravelly material within a depth of 14 inches; on shoulders

Similar inclusions:
- Soils that contain less sand in the subsoil than the Delmont soil
- Soils that contain less sand in the subsoil than the Enet soil
- Soils that have sand and gravel at a depth of 40 to 60 inches

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Poorly suited
Management concerns: The restricted available water capacity, water erosion, and agrochemical leaching
Management considerations:
- These soils are better suited to early maturing crops, such as small grain, than to some other crops. Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion.
- Including grasses and legumes in the rotation helps to control erosion and helps to maintain tilth and the content of organic matter.
- Irrigation helps to overcome the limited ability of the soils to store water if an adequate and dependable supply of water is available.
- Applying nitrogen close to the time when crops will use it reduces the amount of time available for leaching.

Interpretive Groups

Land capability classification: Delmont—4e; Enet—3e
Range site: Delmont—Shallow to Gravel; Enet—Silty
Windbreak suitability group: Delmont—6G; Enet—6G
Pasture suitability group: Delmont—D2; Enet—D1

DgC—Delmont-Talmo complex, 6 to 9 percent slopes

Composition

Delmont and similar soils: 35 to 55 percent
Talmo and similar soils: 15 to 35 percent
Contrasting inclusions: 10 to 30 percent

Setting

Landform: Outwash plains
Position on the landform: Delmont—backslopes and footslopes; Talmo—shoulders
Slope range: 6 to 9 percent
Shape of areas: Irregular
Size of areas: 10 to 100 acres

Typical Profile

Delmont

Surface layer:
0 to 8 inches—very dark gray loam

Subsoil:
8 to 15 inches—very dark gray loam

Underlying layer:
15 to 73 inches—grayish brown and light brownish gray, calcareous gravelly loamy sand and gravelly sand
73 to 80 inches—light gray, calcareous sand

Talmo

Surface layer:
0 to 7 inches—very dark gray, calcareous gravelly loam

Underlying layer:
7 to 15 inches—grayish brown, calcareous very gravelly loamy sand
15 to 80 inches—pale brown and grayish brown, calcareous very gravelly sand

Soil Properties and Qualities

Drainage class: Delmont—somewhat excessively drained; Talmo—excessively drained
Depth to bedrock: Very deep
Depth to contrasting parent material: Delmont—14 to 20 inches over gravelly material; Talmo—0 to 14 inches over gravelly material
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Delmont—moderate in the loamy sediments and very rapid in the underlying gravelly material; Talmo—very rapid
Available water capacity: Delmont—low; Talmo—very low
Content of organic matter: Delmont—moderate; Talmo—moderately low
Surface runoff class: Delmont—medium; Talmo—low
Other properties: The Talmo soil has a high content of lime.

Inclusions

Contrasting inclusions:
- The well drained Enet and Graceville soils, which

are dark to a depth of more than 20 inches; on backslopes and footslopes
- The well drained Flandreau soils, which grade to sandy material within a depth of 40 inches, do not have gravelly material, and have loamy glacial till below a depth of 40 inches; on summits and backslopes
- The well drained Henkin soils, which do not have gravelly material within a depth of 40 inches; on summits and backslopes
- The well drained Shindler soils, which do not have gravelly material within a depth of 40 inches; on shoulders and backslopes

Similar inclusions:
- Soils that have less gravelly material than the Talmo soil
- Soils that contain less sand in the subsoil than the Delmont soil

Use and Management

Cropland and pasture

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Poorly suited
Management concerns: Delmont—the restricted available water capacity, water erosion, and agrochemical leaching; Talmo—the restricted available water capacity, water erosion, agrochemical leaching, and the high content of lime, which adversely affects the availability of plant nutrients
Management considerations:
- These soils are better suited to early maturing crops, such as small grain, than to some other crops. Minimizing tillage and leaving crop residue on the surface help to control water erosion and conserve moisture.
- Including grasses and legumes in the rotation helps to control erosion and helps to maintain the content of organic matter, fertility, and tilth.
- Applying nitrogen close to the time when crops will use it reduces the amount of time available for leaching.
- Seeding cultivated areas to adapted grasses helps to control erosion.

Interpretive Groups

Land capability classification: Delmont—4e; Talmo—6s
Range site: Delmont—Shallow to Gravel; Talmo—Very Shallow
Windbreak suitability group: Delmont—6G; Talmo—10
Pasture suitability group: Delmont—D2; Talmo—NS

DgD—Delmont-Talmo complex, 9 to 15 percent slopes

Composition

Delmont and similar soils: 25 to 50 percent
Talmo and similar soils: 20 to 45 percent
Contrasting inclusions: 10 to 30 percent

Setting

Landform: Moraines
Position on the landform: Delmont—backslopes and footslopes; Talmo—shoulders
Slope range: 9 to 15 percent
Shape of areas: Irregular
Size of areas: 10 to 50 acres

Typical Profile

Delmont

Surface layer:
0 to 8 inches—very dark gray loam

Subsoil:
8 to 15 inches—very dark gray loam

Underlying layer:
15 to 73 inches—grayish brown and light brownish gray, calcareous gravelly loamy sand and gravelly sand
73 to 80 inches—light gray, calcareous sand

Talmo

Surface layer:
0 to 7 inches—very dark gray, calcareous gravelly loam

Underlying layer:
7 to 15 inches—grayish brown, calcareous very gravelly loamy sand
15 to 80 inches—pale brown and grayish brown, calcareous very gravelly sand

Soil Properties and Qualities

Drainage class: Delmont—somewhat excessively drained; Talmo—excessively drained
Depth to bedrock: Very deep
Depth to contrasting parent material: Delmont—14 to 20 inches over gravelly material; Talmo—0 to 14 inches over gravelly material
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Delmont—moderate in the loamy sediments and very rapid in the underlying gravelly material; Talmo—very rapid

Available water capacity: Delmont—low; Talmo—very low
Content of organic matter: Delmont—moderate; Talmo—moderately low
Surface runoff class: Delmont—high; Talmo—low
Other properties: The Talmo soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The well drained Enet soils, which are dark to a depth of more than 20 inches; on backslopes and footslopes
• The well drained Flandreau soils, which grade to sandy material within a depth of 40 inches, do not have gravelly material, and have loamy glacial till below a depth of 40 inches; on summits and backslopes
• The well drained Grovena soils, which do not have gravelly material within a depth of 40 inches; on backslopes
• The somewhat excessively drained Thurman soils, which are sandy and do not have gravelly material within a depth of 40 inches; on summits and shoulders

Similar inclusions:
• Soils that contain less sand in the subsoil than the Delmont soil
• Soils that have less gravelly material than the Talmo soil

Use and Management

Rangeland

Suitability for crops: Generally unsuited
Management concerns: Delmont—the restricted available water capacity, water erosion, and agrochemical leaching; Talmo—the restricted available water capacity, water erosion, agrochemical leaching, and the high content of lime, which adversely affects the availability of plant nutrients
Management considerations:
• Proper grazing management helps to maintain plant vigor, conserves moisture, and helps to control erosion.
• Applying nitrogen close to the time when crops will use it reduces the amount of time available for leaching.
• Seeding cultivated areas to adapted grasses helps to control erosion.

Interpretive Groups

Land capability classification: Delmont—6e; Talmo—6e
Range site: Delmont—Shallow to Gravel; Talmo—Very Shallow
Windbreak suitability group: Delmont—10; Talmo—10
Pasture suitability group: Delmont—NS; Talmo—NS

DmA—Dempster silt loam, 0 to 2 percent slopes

Composition

Dempster and similar soils: 70 to 90 percent
Contrasting inclusions: 10 to 30 percent

Setting

Landform: Outwash plains
Position on the landform: Summits and backslopes
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 10 to 300 acres

Typical Profile

Surface layer:
0 to 9 inches—dark grayish brown silt loam

Subsoil:
9 to 15 inches—grayish brown silty clay loam
15 to 37 inches—light yellowish brown silty clay loam

Underlying layer:
37 to 50 inches—brown, calcareous gravelly loamy sand
50 to 80 inches—light yellowish brown, calcareous very gravelly loamy sand

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: 20 to 40 inches over gravelly material
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderate in the silty sediments and very rapid in the gravelly material
Available water capacity: Moderate
Content of organic matter: Moderate
Surface runoff class: Low

Inclusions

Contrasting inclusions:
• The well drained Flandreau soils, which grade to sandy material within a depth of 40 inches, do not have gravelly material, and have loamy glacial till

below a depth of 40 inches; on summits and backslopes
• The well drained Graceville soils, which are dark to a depth of more than 20 inches and have gravelly material at a depth of more than 40 to 60 inches; on footslopes
• The excessively drained Talmo soils, which have gravelly material within a depth of 14 inches; on shoulders and backslopes
• The moderately well drained Trent soils, which are dark to a depth of more than 20 inches and do not have gravel at a depth of less than 40 inches; on footslopes
• The somewhat poorly drained Whitewood soils on toeslopes

Similar inclusions:
• Soils that contain more sand in the subsoil than the Dempster soil

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: The restricted available water capacity; agrochemical leaching
Management considerations:
• This soil is better suited to early maturing crops, such as small grain, than to some other crops. Minimizing tillage and leaving crop residue on the surface conserve moisture.
• Including grasses and legumes in the rotation helps to control erosion and helps to maintain tilth and the content of organic matter.
• Irrigation helps to overcome the limited ability of the soil to store water if an adequate and dependable supply of water is available.
• Applying nitrogen close to the time when crops will use it reduces the amount of time available for leaching.

Interpretive Groups

Land capability classification: 2s
Range site: Silty
Windbreak suitability group: 6G
Pasture suitability group: D1

DmB—Dempster silt loam, 2 to 6 percent slopes

Composition

Dempster and similar soils: 70 to 90 percent
Contrasting inclusions: 10 to 30 percent

Setting

Landform: Outwash plains
Position on the landform: Summits and backslopes
Slope range: 2 to 6 percent
Shape of areas: Irregular
Size of areas: 10 to 100 acres

Typical Profile

Surface layer:
0 to 9 inches—dark grayish brown silt loam

Subsoil:
9 to 15 inches—grayish brown silty clay loam
15 to 37 inches—light yellowish brown silty clay loam

Underlying layer:
37 to 50 inches—brown, calcareous gravelly loamy sand
50 to 80 inches—light yellowish brown, calcareous very gravelly loamy sand

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: 20 to 40 inches over gravelly material
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderate in the silty sediments and very rapid in the gravelly material
Available water capacity: Moderate
Content of organic matter: Moderate
Surface runoff class: Medium

Inclusions

Contrasting inclusions:
• The poorly drained Arlo soils on low flood plains
• The somewhat poorly drained Dimo soils on high flood plains
• The well drained Graceville soils, which are dark to a depth of more than 20 inches and have gravelly material at a depth of more than 40 to 60 inches; on footslopes
• The well drained Splitrock soils, which have loamy glacial till at a depth of 20 to 40 inches; on summits and backslopes
• The moderately well drained Trent soils, which are dark to a depth of more than 20 inches and do not have gravel at a depth of less than 40 inches; on footslopes

Similar inclusions:
• Soils that contain more sand in the subsoil than the Dempster soil

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Fairly well suited
Management concerns: The restricted available water capacity, water erosion, and agrochemical leaching
Management considerations:
• This soil is better suited to early maturing crops, such as small grain, than to some other crops. Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion.
• Including grasses and legumes in the rotation helps to control erosion and helps to maintain tilth and the content of organic matter.
• Irrigation helps to overcome the limited ability of the soil to store water if an adequate and dependable supply of water is available.
• Applying nitrogen close to the time when crops will use it reduces the amount of time available for leaching.

Interpretive Groups

Land capability classification: 3e
Range site: Silty
Windbreak suitability group: 6G
Pasture suitability group: D1

DtB—Dempster-Talmo complex, 2 to 6 percent slopes

Composition

Dempster and similar soils: 50 to 75 percent
Talmo and similar soils: 15 to 35 percent
Contrasting inclusions: 1 to 15 percent

Setting

Landform: Outwash plains
Position on the landform: Dempster—backslopes; Talmo—shoulders
Slope range: 2 to 6 percent
Shape of areas: Irregular
Size of areas: 10 to 100 acres

Typical Profile

Dempster

Surface layer:
0 to 9 inches—dark grayish brown silt loam

Subsoil:
9 to 15 inches—grayish brown silty clay loam
15 to 37 inches—light yellowish brown silty clay loam

Underlying layer:
37 to 50 inches—brown, calcareous gravelly loamy sand
50 to 80 inches—light yellowish brown, calcareous very gravelly loamy sand

Talmo

Surface layer:
0 to 7 inches—very dark gray, calcareous gravelly loam

Underlying layer:
7 to 15 inches—grayish brown, calcareous very gravelly loamy sand
15 to 80 inches—pale brown and grayish brown, calcareous very gravelly sand

Soil Properties and Qualities

Drainage class: Dempster—well drained; Talmo—excessively drained
Depth to bedrock: Very deep
Depth to contrasting parent material: Dempster—20 to 40 inches over gravelly material; Talmo—0 to 14 inches over gravelly material
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Dempster—moderate in the silty sediments and very rapid in the gravelly material; Talmo—very rapid
Available water capacity: Dempster—moderate; Talmo—very low
Content of organic matter: Dempster—moderate; Talmo—moderately low
Surface runoff class: Dempster—medium; Talmo—very low
Other properties: The Talmo soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Crossplain soils on toeslopes
• The well drained Graceville soils, which are dark to a depth of more than 20 inches and have gravelly material at a depth of more than 40 to 60 inches; on footslopes

Similar inclusions:
• Soils that contain more sand in the subsoil than the Dempster soil

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Poorly suited
Management concerns: Dempster—the restricted available water capacity, water erosion, and agrochemical leaching; Talmo—the restricted available water capacity, water erosion, agrochemical leaching, and the high content of lime, which adversely affects the availability of plant nutrients
Management considerations:
• These soils are better suited to early maturing crops, such as small grain, than to some other crops. Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion.
• Including grasses and legumes in the rotation helps to control erosion and helps to maintain the content of organic matter, fertility, and tilth.
• Irrigation helps to overcome the limited ability of the soils to store water if an adequate and dependable supply of water is available.
• Applying nitrogen close to the time when crops will use it reduces the amount of time available for leaching.

Interpretive Groups

Land capability classification: Dempster—3e; Talmo—6s
Range site: Dempster—Silty; Talmo—Very Shallow
Windbreak suitability group: Dempster—6G; Talmo—10
Pasture suitability group: Dempster—D1; Talmo—NS

Dw—Dimo clay loam, 0 to 2 percent slopes

Composition

Dimo and similar soils: 70 to 90 percent
Contrasting inclusions: 10 to 30 percent

Setting

Landform: High flood plains
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 10 to 50 acres

Typical Profile

Surface layer:
0 to 7 inches—very dark gray clay loam

Subsoil:
7 to 22 inches—very dark gray clay loam
22 to 35 inches—dark gray clay loam that has redoximorphic concentrations
35 to 39 inches—grayish brown clay loam that has redoximorphic concentrations

Underlying layer:
39 to 80 inches—grayish brown, calcareous gravelly loamy sand that has redoximorphic concentrations

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Depth to bedrock: Very deep
Depth to contrasting parent material: 20 to 40 inches over gravelly material
Depth to high water table: 1.5 to 3.0 feet
Flooding: Occasional for brief periods
Ponding: None
Permeability: Moderate in the loamy sediments and very rapid in the underlying gravelly material
Available water capacity: Moderate
Content of organic matter: High
Surface runoff class: Low

Inclusions

Contrasting inclusions:
• The poorly drained Arlo soils, which are calcareous at or near the surface; on low flood plains
• The well drained Graceville soils on footslopes
• The well drained Henkin soils, which do not have gravelly material within a depth of 40 inches; on summits and backslopes
• The moderately well drained Wakonda soils, which are calcareous at the surface; on footslopes

Similar inclusions:
• Soils that contain less sand in the subsoil than the Dimo soil

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: The restricted available water capacity; agrochemical leaching
Management considerations:
• In dry years this soil is better suited to early maturing crops, such as small grain, than to some other crops. Minimizing tillage and leaving crop residue on the surface conserve moisture.
• Including grasses and legumes in the rotation helps

to control erosion and helps to maintain tilth and the content of organic matter.
• Irrigation helps to overcome the limited ability of the soil to store water if an adequate and dependable supply of water is available.
• Applying nitrogen close to the time when crops will use it reduces the amount of time available for leaching.

Interpretive Groups

Land capability classification: 2w
Range site: Loamy Overflow
Windbreak suitability group: 1
Pasture suitability group: K

DxB—Dobalt loam, 2 to 6 percent slopes

Composition

Dobalt and similar soils: 80 to 95 percent
Contrasting inclusions: 5 to 20 percent

Setting

Landform: Till plains
Position on the landform: Summits and backslopes
Slope range: 2 to 6 percent
Shape of areas: Irregular
Size of areas: 10 to 80 acres

Typical Profile

Surface layer:
0 to 8 inches—dark grayish brown loam

Subsoil:
8 to 19 inches—brown loam
19 to 29 inches—yellowish brown sandy clay loam that has relict redoximorphic concentrations
29 to 59 inches—light yellowish brown, calcareous clay loam that has redoximorphic concentrations and depletions

Underlying layer:
59 to 80 inches—light brownish gray, calcareous clay loam that has redoximorphic concentrations and depletions

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: 20 to 40 inches over loamy glacial till
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Content of organic matter: Moderate
Surface runoff class: Medium

Inclusions

Contrasting inclusions:
• The well drained Flandreau soils, which grade to sandy material within a depth of 40 inches; on summits and backslopes
• The well drained Grovena soils, which do not have loamy glacial till within a depth of 40 inches; on backslopes
• The well drained Shindler soils, which have a calcareous subsoil; on shoulders
• The somewhat excessively drained Thurman soils, which are sandy; on summits and shoulders
• The moderately well drained Bonilla soils on footslopes
• The somewhat poorly drained Whitewood soils on toeslopes

Similar inclusions:
• Soils that formed entirely in loamy glacial till
• Soils that contain less sand in the subsoil than the Dobalt soil

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Water erosion
Management considerations:
• Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture.
• Contour farming and grassed waterways help to control water erosion, but slopes in some areas are too short or too irregular for contour farming.
• Including grasses and legumes in the rotation helps to control erosion and helps to maintain tilth and the content of organic matter.

Interpretive Groups

Land capability classification: 2e
Range site: Silty
Windbreak suitability group: 3
Pasture suitability group: F

DyA—Dobalt-Bonilla loams, 0 to 2 percent slopes

Composition

Dobalt and similar soils: 60 to 85 percent
Bonilla and similar soils: 10 to 25 percent
Contrasting inclusions: 5 to 20 percent

Setting

Landform: Till plains
Position on the landform: Dobalt—summits and backslopes; Bonilla—footslopes
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 10 to 80 acres

Typical Profile

Dobalt

Surface layer:
0 to 8 inches—dark grayish brown loam

Subsoil:
8 to 19 inches—brown loam
19 to 29 inches—yellowish brown sandy clay loam that has relict redoximorphic concentrations
29 to 59 inches—light yellowish brown, calcareous clay loam that has redoximorphic concentrations and depletions

Underlying layer:
59 to 80 inches—light brownish gray, calcareous clay loam that has redoximorphic concentrations and depletions

Bonilla

Surface soil:
0 to 11 inches—dark gray loam

Subsoil:
11 to 22 inches—dark gray clay loam
22 to 32 inches—light olive brown clay loam
32 to 45 inches—light yellowish brown, calcareous clay loam that has redoximorphic depletions

Underlying layer:
45 to 80 inches—light yellowish brown, calcareous, stratified silt loam that has redoximorphic depletions

Soil Properties and Qualities

Drainage class: Dobalt—well drained; Bonilla—moderately well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: Dobalt—20 to 40 inches over loamy glacial till; Bonilla—more than 60 inches
Depth to high water table: Dobalt—more than 6 feet; Bonilla—3.5 to 5.0 feet
Flooding: None
Ponding: None
Permeability: Dobalt—moderately slow; Bonilla—moderate
Available water capacity: High
Content of organic matter: Dobalt—moderate; Bonilla—high
Surface runoff class: Low
Other properties: Runoff water flows over the Bonilla soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
- The well drained Flandreau soils, which grade to sandy material within a depth of 40 inches; on summits and backslopes
- The well drained Grovena soils, which do not have loamy glacial till within a depth of 40 inches; on backslopes
- The moderately well drained, silty Trent soils on footslopes
- The somewhat poorly drained Whitewood soils on toeslopes

Similar inclusions:
- Soils that formed entirely in loamy glacial till
- Soils that contain less sand in the subsoil than the Dobalt soil

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Few limitations
Management considerations:
- Managing crop residue conserves moisture and helps to maintain tilth and the content of organic matter.

Interpretive Groups

Land capability classification: Dobalt—1; Bonilla—1
Range site: Dobalt—Silty; Bonilla—Loamy Overflow
Windbreak suitability group: Dobalt—3; Bonilla—1
Pasture suitability group: Dobalt—F; Bonilla—K

EaB—Egan-Ethan complex, 2 to 6 percent slopes

Composition

Egan and similar soils: 50 to 75 percent
Ethan and similar soils: 20 to 40 percent
Contrasting inclusions: 5 to 25 percent

Setting

Landform: Till plains
Position on the landform: Egan—summits and backslopes; Ethan—shoulders

Slope range: 2 to 6 percent
Shape of areas: Irregular
Size of areas: 20 to 500 acres

Typical Profile

Egan

Surface layer:
0 to 10 inches—very dark grayish brown silty clay loam

Subsoil:
10 to 20 inches—brown silty clay loam
20 to 28 inches—pale brown silty clay loam
28 to 35 inches—light brownish gray, calcareous clay loam that has relict redoximorphic features
35 to 43 inches—pale yellow, calcareous clay loam that has relict redoximorphic features

Underlying layer:
43 to 65 inches—pale yellow, calcareous clay loam that has redoximorphic concentrations
65 to 80 inches—pale yellow, calcareous clay loam that has redoximorphic concentrations and depletions

Ethan

Surface layer:
0 to 9 inches—grayish brown, calcareous loam

Subsoil:
9 to 39 inches—light brownish gray, calcareous clay loam that has relict redoximorphic features

Underlying layer:
39 to 80 inches—light brownish gray, calcareous clay loam that has relict redoximorphic features

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: Egan—24 to 40 inches over loamy glacial till; Ethan—more than 60 inches
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Content of organic matter: Egan—moderate; Ethan—moderately low
Surface runoff class: Medium
Other properties: The Ethan soil has a high content of lime.

Inclusions

Contrasting inclusions:
- The well drained Betts soils, which are dark to a depth of 5 inches or less; on shoulders
- The somewhat poorly drained Chancellor soils, which contain more clay than the major soils; on toeslopes
- The well drained Clarno and Henkin soils, which have less silt and more sand than the Egan soil and are not calcareous at or near the surface; on backslopes
- The moderately well drained Davison soils, which are calcareous at the surface; on footslopes

Similar inclusions:
- Soils that formed in parent material that does not have glacial till above a depth of 40 inches

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Egan—water erosion; Ethan—wind erosion, water erosion, and the high content of lime, which adversely affects the availability of plant nutrients
Management considerations:
- Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture.
- Contour farming and grassed waterways help to control water erosion, but the slopes in some areas are too short or too irregular for contour farming.
- Including grasses and legumes in the rotation helps to control erosion and helps to maintain the content of organic matter, fertility, and tilth.
- Wind stripcropping and field windbreaks help to control wind erosion.

Interpretive Groups

Land capability classification: Egan—2e; Ethan—3e
Range site: Egan—Silty; Ethan—Thin Upland
Windbreak suitability group: Egan—3; Ethan—8
Pasture suitability group: Egan—F; Ethan—G

EeB—Egan-Ethan-Trent complex, 1 to 6 percent slopes

Composition

Egan and similar soils: 25 to 45 percent
Ethan and similar soils: 15 to 35 percent

Trent and similar soils: 15 to 35 percent
Contrasting inclusions: 5 to 25 percent

Setting

Landform: Till plains
Position on the landform: Egan—backslopes; Ethan—shoulders; Trent—footslopes
Slope range: Egan—2 to 6 percent; Ethan—2 to 6 percent; Trent—1 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 1,000 acres

Typical Profile

Egan

Surface layer:
0 to 10 inches—very dark grayish brown silty clay loam

Subsoil:
10 to 20 inches—brown silty clay loam
20 to 28 inches—pale brown silty clay loam
28 to 35 inches—light brownish gray, calcareous clay loam that has relict redoximorphic features
35 to 43 inches—pale yellow, calcareous clay loam that has relict redoximorphic features

Underlying layer:
43 to 65 inches—pale yellow, calcareous clay loam that has redoximorphic concentrations
65 to 80 inches—pale yellow, calcareous clay loam that has redoximorphic concentrations and depletions

Ethan

Surface layer:
0 to 9 inches—grayish brown, calcareous loam

Subsoil:
9 to 39 inches—light brownish gray, calcareous clay loam that has relict redoximorphic features

Underlying layer:
39 to 80 inches—light brownish gray, calcareous clay loam that has relict redoximorphic features

Trent

Surface soil:
0 to 15 inches—dark gray silty clay loam

Subsoil:
15 to 23 inches—dark grayish brown silty clay loam
23 to 28 inches—pale brown silty clay loam
28 to 46 inches—brown silty clay loam and silt loam; redoximorphic concentrations in the upper part and redoximorphic concentrations and depletions in the lower part
46 to 52 inches—light brownish gray, calcareous silt loam that has redoximorphic concentrations and depletions

Underlying layer:
52 to 80 inches—light brownish gray, calcareous silt loam that has redoximorphic concentrations and depletions

Soil Properties and Qualities

Drainage class: Egan—well drained; Ethan—well drained; Trent—moderately well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: Egan—24 to 40 inches over loamy glacial till; Ethan—more than 60 inches; Trent—more than 40 inches over loamy glacial till
Depth to high water table: Egan—more than 6 feet; Ethan—more than 6 feet; Trent—3.5 to 5.0 feet
Flooding: None
Ponding: None
Permeability: Egan—moderately slow; Ethan—moderately slow; Trent—moderate
Available water capacity: High
Content of organic matter: Egan—moderate; Ethan—moderately low; Trent—high
Surface runoff class: Egan—medium; Ethan—medium; Trent—low
Other properties: The Ethan soil has a high content of lime. Runoff water flows over the Trent soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
- The well drained Clarno soils, which have less silt and more sand than the Egan soil and are calcareous at a greater depth than the Ethan soil; on backslopes
- The well drained Huntimer soils, which have more clay in the subsoil than the major soils; on backslopes
- The well drained Crofton soils, which have more silt and less sand than the Ethan soil; on shoulders
- The moderately well drained Davison soils, which are calcareous at the surface; on footslopes
- The somewhat poorly drained Whitewood soils on toeslopes
- The poorly drained Tetonka soils in shallow basins
- The excessively well drained Talmo soils, which have gravelly material within a depth of 14 inches; on shoulders

Similar inclusions:
- Soils that are similar to the Egan soil but do not have glacial till above a depth of 40 inches

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Egan—water erosion; Ethan—wind erosion, water erosion, and the high content of lime, which adversely affects the availability of plant nutrients; Trent—few limitations
Management considerations:
• Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture.
• Contour farming and grassed waterways help to control water erosion, but the slopes in some areas are too short or too irregular for contour farming.
• Including grasses and legumes in the rotation helps to control erosion and helps to maintain the content of organic matter, fertility, and tilth.
• Wind stripcropping and field windbreaks help to control wind erosion.

Interpretive Groups

Land capability classification: Egan—2e; Ethan—3e; Trent—1
Range site: Egan—Silty; Ethan—Thin Upland; Trent—Loamy Overflow
Windbreak suitability group: Egan—3; Ethan—8; Trent—1
Pasture suitability group: Egan—F; Ethan—G; Trent—K

EfA—Egan-Trent silty clay loams, 0 to 2 percent slopes

Composition

Egan and similar soils: 35 to 60 percent
Trent and similar soils: 15 to 40 percent
Contrasting inclusions: 5 to 25 percent

Setting

Landform: Till plains
Position on the landform: Egan—summits and backslopes; Trent—footslopes
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 20 to 200 acres

Typical Profile

Egan

Surface layer:
0 to 10 inches—very dark grayish brown silty clay loam

Subsoil:
10 to 20 inches—brown silty clay loam
20 to 28 inches—pale brown silty clay loam
28 to 35 inches—light brownish gray, calcareous clay loam that has relict redoximorphic features
35 to 43 inches—pale yellow, calcareous clay loam that has relict redoximorphic features

Underlying layer:
43 to 65 inches—pale yellow, calcareous clay loam that has redoximorphic concentrations
65 to 80 inches—pale yellow, calcareous clay loam that has redoximorphic concentrations and depletions

Trent

Surface soil:
0 to 15 inches—dark gray silty clay loam

Subsoil:
15 to 23 inches—dark grayish brown silty clay loam
23 to 28 inches—pale brown silty clay loam
28 to 46 inches—brown silty clay loam and silt loam; redoximorphic concentrations in the upper part and redoximorphic concentrations and depletions in the lower part
46 to 52 inches—light brownish gray, calcareous silt loam that has redoximorphic concentrations and depletions

Underlying layer:
52 to 80 inches—light brownish gray, calcareous silt loam that has redoximorphic concentrations and depletions

Soil Properties and Qualities

Drainage class: Egan—well drained; Trent—moderately well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: Egan—24 to 40 inches over loamy glacial till; Trent—more than 40 inches over loamy glacial till
Depth to high water table: Egan—more than 6 feet; Trent—3.5 to 5.0 feet
Flooding: None
Ponding: None
Permeability: Egan—moderately slow; Trent—moderate
Available water capacity: High
Content of organic matter: Egan—moderate; Trent—high
Surface runoff class: Low
Other properties: Runoff water flows over the Trent soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
- The moderately well drained Bonilla soils, which have more sand and less silt than the Trent soil; on footslopes
- The somewhat poorly drained Chancellor soils, which contain more clay than the major soils; on toeslopes
- The poorly drained Tetonka soils in shallow basins
- The well drained Clarno soils, which have less silt and more sand than the major soils; on backslopes
- The moderately well drained Wakonda soils, which are calcareous at the surface; on footslopes

Similar inclusions:
- Soils that do not have glacial till above a depth of 40 inches
- Soils that have clay loam underlying material within a depth of 40 inches
- Soils that contain more clay in the subsoil than the Egan soil

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Few limitations
Management considerations:
- Managing crop residue conserves moisture and helps to maintain tilth and the content of organic matter.

Interpretive Groups

Land capability classification: Egan—1; Trent—1
Range site: Egan—Silty; Trent—Loamy Overflow
Windbreak suitability group: Egan—3; Trent—1
Pasture suitability group: Egan—F; Trent—K

EgB—Egan-Wentworth-Trent silty clay loams, 1 to 6 percent slopes

Composition

Egan and similar soils: 25 to 50 percent
Wentworth and similar soils: 20 to 50 percent
Trent and similar soils: 15 to 30 percent
Contrasting inclusions: 5 to 25 percent

Setting

Landform: Till plains
Position on the landform: Egan—shoulders; Wentworth—backslopes; Trent—footslopes
Slope range: Egan—2 to 6 percent; Wentworth—2 to 6 percent; Trent—1 to 2 percent
Shape of areas: Irregular
Size of areas: 15 to 200 acres

Typical Profile

Egan

Surface layer:
0 to 10 inches—very dark grayish brown silty clay loam

Subsoil:
10 to 20 inches—brown silty clay loam
20 to 28 inches—pale brown silty clay loam
28 to 35 inches—light brownish gray, calcareous clay loam that has relict redoximorphic features
35 to 43 inches—pale yellow, calcareous clay loam that has relict redoximorphic features

Underlying layer:
43 to 65 inches—pale yellow, calcareous clay loam that has redoximorphic concentrations
65 to 80 inches—pale yellow, calcareous clay loam that has redoximorphic concentrations and depletions

Wentworth

Surface layer:
0 to 10 inches—dark gray silty clay loam

Subsoil:
10 to 26 inches—brown silty clay loam
26 to 43 inches—light yellowish brown, calcareous silty clay loam
43 to 55 inches—light yellowish brown, calcareous silty clay loam that has redoximorphic depletions

Underlying layer:
55 to 80 inches—light brownish gray, calcareous silt loam and stratified fine sandy loam; redoximorphic concentrations and depletions

Trent

Surface soil:
0 to 15 inches—dark gray silty clay loam

Subsoil:
15 to 23 inches—dark grayish brown silty clay loam
23 to 28 inches—pale brown silty clay loam
28 to 46 inches—brown silty clay loam and silt loam; redoximorphic concentrations in the upper part and redoximorphic concentrations and depletions in the lower part

46 to 52 inches—light brownish gray, calcareous silt loam that has redoximorphic concentrations and depletions

Underlying layer:
52 to 80 inches—light brownish gray, calcareous silt loam that has redoximorphic concentrations and depletions

Soil Properties and Qualities

Drainage class: Egan—well drained; Wentworth—well drained; Trent—moderately well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: Egan—24 to 40 inches over loamy glacial till; Wentworth—more than 40 inches over loamy glacial till; Trent—more than 40 inches over loamy glacial till
Depth to high water table: Egan—more than 6 feet; Wentworth—more than 6 feet; Trent—3.5 to 5.0 feet
Flooding: None
Ponding: None
Permeability: Egan—moderately slow; Wentworth—moderate; Trent—moderate
Available water capacity: High
Content of organic matter: Egan—moderate; Wentworth—moderate; Trent—high
Surface runoff class: Egan—medium; Wentworth—medium; Trent—low
Other properties: Runoff water flows over the Trent soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
• The well drained Clarno soils, which have less silt and more sand than the major soils; on backslopes
• The moderately well drained, loamy Davison soils, which are calcareous at the surface; on footslopes
• The somewhat poorly drained Crossplain soils on toeslopes
• The moderately well drained, silty Wakonda soils, which are calcareous to the surface; on footslopes
• The well drained Ethan soils, which are calcareous at the surface and contain more sand and less silt than the major soils; on shoulders
• The somewhat poorly drained Whitewood soils on toeslopes
• The poorly drained Tetonka soils in shallow basins

Similar inclusions:
• Soils that contain more sand and less silt throughout
• Soils that contain more clay in the subsoil than the Egan soil

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Egan—water erosion; Wentworth—water erosion; Trent—few limitations
Management considerations:
• Minimizing tillage and leaving crop residue on the surface help to control water erosion and conserve moisture.
• Contour farming and grassed waterways help to control water erosion, but the slopes in some areas are too short or too irregular for contour farming.
• Including grasses and legumes in the rotation helps to control erosion and helps to maintain tilth and the content of organic matter.

Interpretive Groups

Land capability classification: Egan—2e; Wentworth—2e; Trent—1
Range site: Egan—Silty; Wentworth—Silty; Trent—Loamy Overflow
Windbreak suitability group: Egan—3; Wentworth—3; Trent—1
Pasture suitability group: Egan—F; Wentworth—F; Trent—K

EnA—Enet loam, 0 to 2 percent slopes, rarely flooded

Composition

Enet and similar soils: 75 to 95 percent
Contrasting inclusions: 5 to 25 percent

Setting

Landform: High flood plains
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 10 to 100 acres

Typical Profile

Surface layer:
0 to 7 inches—very dark gray loam

Subsoil:
7 to 23 inches—very dark gray loam
23 to 28 inches—brown sandy loam

Underlying layer:
28 to 80 inches—light yellowish brown, calcareous gravelly sand

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: 20 to 40 inches over gravelly material
Depth to high water table: 3.5 to 6.0 feet
Frequency of flooding: Rare
Ponding: None
Permeability: Moderate in the loamy sediments and very rapid in the gravelly material
Available water capacity: Moderate
Content of organic matter: Moderate
Surface runoff class: Low
Other properties: Runoff water flows over this soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
- The poorly drained Arlo soils, which are calcareous at the surface; on toeslopes
- The somewhat excessively drained Delmont soils, which have gravelly material at a depth of 14 to 20 inches; on backslopes and footslopes
- The somewhat poorly drained Dimo soils on footslopes and toeslopes
- The moderately well drained Janude soils, which do not have gravelly material within a depth of 40 inches; on high flood plains

Similar inclusions:
- Soils that contain less gravelly material within a depth of 40 inches than the Enet soil
- Soils that are dark to a depth of less than 20 inches

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: The restricted available water capacity; agrochemical leaching
Management considerations:
- This soil is better suited to early maturing crops, such as small grain, than to some other crops. Minimizing tillage and leaving crop residue on the surface conserve moisture.
- Including grasses and legumes in the rotation helps to control erosion and helps to maintain tilth and the content of organic matter.
- Irrigation helps to overcome the limited ability of the soil to store water if an adequate and dependable supply of water is available.
- Applying nitrogen close to the time when crops will use it reduces the amount of time available for leaching.

Interpretive Groups

Land capability classification: 2s
Range site: Silty
Windbreak suitability group: 6G
Pasture suitability group: D1

EoA—Enet-Dimo complex, 0 to 2 percent slopes

Composition

Enet and similar soils: 35 to 60 percent
Dimo and similar soils: 25 to 50 percent
Contrasting inclusions: 10 to 25 percent

Setting

Landform: High flood plains
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 15 to 100 acres

Typical Profile

Enet

Surface layer:
0 to 7 inches—very dark gray loam

Subsoil:
7 to 23 inches—very dark gray loam
23 to 28 inches—brown sandy loam

Underlying layer:
28 to 80 inches—light yellowish brown, calcareous gravelly sand

Dimo

Surface layer:
0 to 7 inches—very dark gray clay loam

Subsoil:
7 to 22 inches—very dark gray clay loam
22 to 35 inches—dark gray clay loam that has redoximorphic concentrations
35 to 39 inches—grayish brown clay loam that has redoximorphic concentrations

Underlying layer:
39 to 80 inches—grayish brown, calcareous

gravelly loamy sand that has redoximorphic concentrations

Soil Properties and Qualities

Drainage class: Enet—well drained; Dimo—somewhat poorly drained
Depth to bedrock: Very deep
Depth to contrasting parent material: 20 to 40 inches over gravelly material
Depth to high water table: Enet—3.5 to 6.0 feet; Dimo—1.5 to 3.0 feet
Flooding: Enet—rare; Dimo—occasional for brief periods
Ponding: None
Permeability: Moderate in the loamy sediments and very rapid in the underlying gravelly material
Available water capacity: Moderate
Content of organic matter: Enet—moderate; Dimo—high
Surface runoff class: Low
Other properties: Runoff water flows over the Enet soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
• The poorly drained Arlo soils, which are calcareous at the surface; on toeslopes
• The poorly drained Clamo soils, which contain more clay than the major soils; on low flood plains
• The moderately well drained Janude soils, which do not have gravelly material within a depth of 40 inches; on high flood plains
• The somewhat poorly drained Lamo soils, which have more silt and less sand than the major soils; on low flood plains

Similar inclusions:
• Soils that have less gravelly material within a depth of 40 inches
• Soils that are dark to a depth of less than 20 inches
• Soils that are calcareous at a depth of less than 15 inches

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: The restricted available water capacity; agrochemical leaching
Management considerations:
• These soils are better suited to early maturing crops, such as small grain, than to some other crops. Minimizing tillage and leaving crop residue on the surface conserve moisture.
• Including grasses and legumes in the rotation helps to control erosion and helps to maintain tilth and the content of organic matter.
• Irrigation helps to overcome the limited ability of the soils to store water if an adequate and dependable supply of water is available.
• Applying nitrogen close to the time when crops will use it reduces the amount of time available for leaching.

Interpretive Groups

Land capability classification: Enet—2e; Dimo—2w
Range site: Enet—Silty; Dimo—Loamy Overflow
Windbreak suitability group: Enet—6G; Dimo—1
Pasture suitability group: Enet—D1; Dimo—K

EpD—Ethan-Betts loams, 9 to 15 percent slopes

Composition

Ethan and similar soils: 30 to 55 percent
Betts and similar soils: 20 to 45 percent
Contrasting inclusions: 5 to 25 percent

Setting

Landform: Moraines
Position on the landform: Ethan—backslopes; Betts—shoulders
Slope range: 9 to 15 percent
Shape of areas: Irregular or elongated
Size of areas: 20 to 150 acres

Typical Profile

Ethan

Surface layer:
0 to 9 inches—grayish brown, calcareous loam

Subsoil:
9 to 39 inches—light brownish gray, calcareous clay loam that has relict redoximorphic features

Underlying layer:
39 to 80 inches—light brownish gray, calcareous clay loam that has relict redoximorphic features

Betts

Surface layer:
0 to 5 inches—dark grayish brown, calcareous loam

Subsoil:
5 to 26 inches—light yellowish brown, calcareous clay loam

Underlying layer:
26 to 35 inches—light yellowish brown, calcareous clay loam that has relict redoximorphic features
35 to 80 inches—light yellowish brown, calcareous clay loam that has relict redoximorphic features

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Content of organic matter: Moderately low
Surface runoff class: High
Other properties: Both soils have a high content of lime.

Inclusions

Contrasting inclusions:
• The well drained Clarno and Egan soils, which do not have lime in the upper 12 inches; on backslopes
• The well drained Davis soils, which have dark colors extending to a depth of more than 20 inches; on footslopes
• The moderately well drained Davison soils on footslopes adjacent to wet areas
• The poorly drained Tetonka soils in shallow basins
• The somewhat excessively drained Delmont soils, which have gravelly material at a depth of 14 to 20 inches; on shoulders and backslopes

Similar inclusions:
• Soils that have more silt and less sand than the Ethan and Betts soils

Use and Management

Cropland and pasture

Suitability for crops: Generally unsuited
Management concerns: Wind erosion, water erosion, and the high content of lime, which adversely affects the availability of plant nutrients
Management considerations:
• Proper grazing management helps to maintain plant vigor, conserves moisture, and helps to control erosion.
• Seeding cultivated areas to adapted grasses helps to control erosion.

Interpretive Groups

Land capability classification: Ethan—6e; Betts—6e
Range site: Ethan—Thin Upland; Betts—Thin Upland
Windbreak suitability group: Ethan—8; Betts—8
Pasture suitability group: Ethan—G; Betts—G

EsE—Ethan-Clarno loams, 6 to 25 percent slopes, very stony

Composition

Ethan and similar soils: 40 to 65 percent
Clarno and similar soils: 20 to 45 percent
Contrasting inclusions: 5 to 25 percent

Setting

Landform: Moraines
Position on the landform: Ethan—shoulders; Clarno—backslopes
Slope range: Ethan—9 to 25 percent; Clarno—6 to 15 percent
Shape of areas: Irregular or elongated
Size of areas: 10 to 100 acres

Typical Profile

Ethan

Surface layer:
0 to 9 inches—grayish brown, calcareous loam

Subsoil:
9 to 39 inches—light brownish gray, calcareous clay loam that has relict redoximorphic features

Underlying layer:
39 to 80 inches—light brownish gray, calcareous clay loam that has relict redoximorphic features

Clarno

Surface layer:
0 to 10 inches—very dark gray loam

Subsoil:
10 to 14 inches—dark grayish brown loam
14 to 22 inches—brown loam
22 to 29 inches—light olive brown, calcareous loam
29 to 44 inches—light yellowish brown, calcareous clay loam that has relict redoximorphic features

Underlying layer:
44 to 80 inches—light yellowish brown, calcareous clay loam that has redoximorphic concentrations and depletions

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep

Depth to contrasting parent material: More than 60 inches
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Content of organic matter: Ethan—moderately low; Clarno—moderate
Surface runoff class: High
Other properties: The Ethan soil has a high content of lime. In areas of both soils, 0.1 to 3.0 percent of the surface is covered with stones and boulders 1 to 3 feet in diameter.

Inclusions

Contrasting inclusions:
• The well drained Betts soils, which are dark to a depth of 5 inches or less; on shoulders
• The well drained Davis soils and the moderately well drained Bonilla soils, which have dark colors extending to a depth of more than 20 inches; on footslopes
• The moderately well drained Davison soils, which are calcareous at the surface; on footslopes
• The poorly drained Tetonka soils in shallow basins
• The excessively drained Talmo soils, which have gravelly material within a depth of 14 inches; on shoulders and backslopes

Similar inclusions:
• Soils that have more silt and less sand than the Ethan and Clarno soils

Use and Management

Rangeland

Suitability for crops: Not suited
Management concerns: Ethan—wind erosion, water erosion, the high content of lime (which adversely affects the availability of plant nutrients), and stoniness; Clarno—water erosion, stoniness
Management considerations:
• Proper grazing management helps to maintain plant vigor, conserves moisture, and helps to control erosion.

Interpretive Groups

Land capability classification: Ethan—7s; Clarno—7s
Range site: Ethan—Thin Upland; Clarno—Silty
Windbreak suitability group: Ethan—10; Clarno—10
Pasture suitability group: Ethan—NS; Clarno—NS

EtD—Ethan-Clarno loams, 9 to 15 percent slopes

Composition

Ethan and similar soils: 30 to 60 percent
Clarno and similar soils: 20 to 40 percent
Contrasting inclusions: 5 to 25 percent

Setting

Landform: Moraines
Position on the landform: Ethan—shoulders; Clarno—backslopes
Slope range: 9 to 15 percent
Shape of areas: Irregular or elongated
Size of areas: 10 to 100 acres

Typical Profile

Ethan

Surface layer:
0 to 9 inches—grayish brown, calcareous loam

Subsoil:
9 to 39 inches—light brownish gray, calcareous clay loam that has relict redoximorphic features

Underlying layer:
39 to 80 inches—light brownish gray, calcareous clay loam that has relict redoximorphic features

Clarno

Surface layer:
0 to 10 inches—very dark gray loam

Subsoil:
10 to 14 inches—dark grayish brown loam
14 to 22 inches—brown loam
22 to 29 inches—light olive brown, calcareous loam
29 to 44 inches—light yellowish brown, calcareous clay loam that has relict redoximorphic features

Underlying layer:
44 to 80 inches—light yellowish brown, calcareous clay loam that has redoximorphic concentrations and depletions

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None

Permeability: Moderately slow
Available water capacity: High
Content of organic matter: Ethan—moderately low; Clarno—moderate
Surface runoff class: High
Other properties: The Ethan soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The well drained Betts soils, which are dark to a depth of 5 inches or less; on shoulders
• The somewhat poorly drained Chaska soils on low flood plains
• The poorly drained Tetonka soils in shallow basins
• The well drained Egan soils, which have more silt and less sand than the Clarno soil; on backslopes
• The excessively drained Talmo soils, which have gravelly material within a depth of 14 inches; on shoulders

Similar inclusions:
• Soils that have more silt and less sand than the Ethan and Clarno soils

Use and Management

Cropland and pasture

Main crops: Ethan—generally unsuited; Clarno—alfalfa, barley, corn, oats, and spring wheat
Suitability for crops: Poorly suited
Management concerns: Ethan—wind erosion, water erosion, and the high content of lime, which adversely affects the availability of plant nutrients; Clarno—water erosion
Management considerations:
• Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion.
• Contour farming, terraces, and grassed waterways help to control water erosion, but the slopes in some areas are too short or too irregular for contour farming or terraces.
• Wind stripcropping and field windbreaks help to control wind erosion.
• Including grasses and legumes in the rotation helps to control erosion and helps to maintain the content of organic matter, fertility, and tilth.
• Establishing permanent pasture and hayland species helps to control erosion.
• Proper grazing management helps to maintain plant vigor and control erosion.

Interpretive Groups

Land capability classification: Ethan—6e; Clarno—4e
Range site: Ethan—Thin Upland; Clarno—Silty
Windbreak suitability group: Ethan—8; Clarno—3
Pasture suitability group: Ethan—G; Clarno—F

EuC—Ethan-Egan complex, 6 to 9 percent slopes

Composition

Ethan and similar soils: 30 to 55 percent
Egan and similar soils: 20 to 45 percent
Contrasting inclusions: 5 to 25 percent

Setting

Landform: Till plains
Position on the landform: Ethan—shoulders; Egan—backslopes
Slope range: 6 to 9 percent
Shape of areas: Irregular
Size of areas: 5 to 300 acres

Typical Profile

Ethan

Surface layer:
0 to 9 inches—grayish brown, calcareous loam

Subsoil:
9 to 39 inches—light brownish gray, calcareous clay loam that has relict redoximorphic features

Underlying layer:
39 to 80 inches—light brownish gray, calcareous clay loam that has relict redoximorphic features

Egan

Surface layer:
0 to 10 inches—very dark grayish brown silty clay loam

Subsoil:
10 to 20 inches—brown silty clay loam
20 to 28 inches—pale brown silty clay loam
28 to 35 inches—light brownish gray, calcareous clay loam that has relict redoximorphic features
35 to 43 inches—pale yellow, calcareous clay loam that has relict redoximorphic features

Underlying layer:
43 to 65 inches—pale yellow, calcareous clay loam that has redoximorphic concentrations
65 to 80 inches—pale yellow, calcareous clay loam that has redoximorphic concentrations and depletions

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep

Depth to contrasting parent material: Ethan—more than 60 inches; Egan—24 to 40 inches over loamy glacial till
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Content of organic matter: Ethan—moderately low; Egan—moderate
Surface runoff class: Medium
Other properties: The Ethan soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The well drained Alcester and Davis soils and the moderately well drained Trent soils, which are dark to a depth of more than 20 inches; on footslopes
• The well drained Betts soils, which are dark to a depth of 5 inches or less; on shoulders
• The well drained Clarno soils, which have less silt and more sand than the Egan soil and are not calcareous above a depth of 26 inches; on backslopes
• The well drained Huntimer soils, which have more clay than the major soils; on summits and backslopes
• The poorly drained Tetonka soils in shallow basins

Similar inclusions:
• Soils that do not have glacial till above a depth of 40 inches

Use and Management

Cropland and pasture

Main crops: Alfalfa, barley, corn, oats, soybeans, and spring wheat
Suitability for crops: Poorly suited
Management concerns: Ethan—wind erosion, water erosion, and the high content of lime, which adversely affects the availability of plant nutrients; Egan—water erosion
Management considerations:
• Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion.
• Contour farming, terraces, and grassed waterways help to control water erosion, but the slopes in most areas are too short or too irregular for contour farming or terraces.
• Wind stripcropping and field windbreaks help to control wind erosion.
• Including grasses and legumes in the rotation helps to control erosion and helps to maintain the content of organic matter, fertility, and tilth.
• Seeding cultivated areas to adapted grasses helps to control erosion.

Interpretive Groups

Land capability classification: Ethan—4e; Egan—3e
Range site: Ethan—Thin Upland; Egan—Silty
Windbreak suitability group: Ethan—8; Egan—3
Pasture suitability group: Ethan—G; Egan—F

ExC—Ethan, very stony-Egan complex, 2 to 9 percent slopes

Composition

Ethan and similar soils: 30 to 55 percent
Egan and similar soils: 25 to 45 percent
Contrasting inclusions: 5 to 25 percent

Setting

Landform: Moraines
Position on the landform: Ethan—shoulders; Egan—backslopes
Slope range: Ethan—6 to 9 percent; Egan—2 to 9 percent
Shape of areas: Irregular
Size of areas: 10 to 150 acres

Typical Profile

Ethan

Surface layer:
0 to 9 inches—grayish brown, calcareous loam

Subsoil:
9 to 39 inches—light brownish gray, calcareous clay loam that has relict redoximorphic features

Underlying layer:
39 to 80 inches—light brownish gray, calcareous clay loam that has relict redoximorphic features

Egan

Surface layer:
0 to 10 inches—very dark grayish brown silty clay loam

Subsoil:
10 to 20 inches—brown silty clay loam
20 to 28 inches—pale brown silty clay loam
28 to 35 inches—light brownish gray, calcareous clay loam that has relict redoximorphic features
35 to 43 inches—pale yellow, calcareous clay loam that has relict redoximorphic features

Underlying layer:
43 to 65 inches—pale yellow, calcareous clay loam that has redoximorphic concentrations
65 to 80 inches—pale yellow, calcareous clay loam that has redoximorphic concentrations and depletions

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: Ethan—more than 60 inches; Egan—24 to 40 inches over loamy glacial till
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Content of organic matter: Ethan—moderately low; Egan—moderate
Surface runoff class: Medium
Other properties: The Ethan soil has a high content of lime. In areas of the Ethan soil, 0.1 to 2.0 percent of the surface is covered with stones and boulders 1 to 3 feet in diameter.

Inclusions

Contrasting inclusions:
- The well drained Alcester and Davis soils and the moderately well drained Trent soils, which are dark to a depth of more than 20 inches; on footslopes
- The well drained Clarno soils, which have less silt and more sand than the Egan soil and are not calcareous above a depth of 26 inches; on backslopes
- The somewhat poorly drained Chaska soils on low flood plains
- The poorly drained Tetonka soils in shallow basins

Similar inclusions:
- Soils that do not have glacial till above a depth of 40 inches

Use and Management

Rangeland

Suitability for crops: Not suited
Management concerns: Ethan—stoniness, water erosion, wind erosion, and the high content of lime, which adversely affects the availability of plant nutrients; Egan—water erosion
Management considerations:
- Proper grazing management helps to maintain plant vigor, conserves moisture, and helps to control erosion.

Interpretive Groups

Land capability classification: Ethan—7s; Egan—3e
Range site: Ethan—Thin Upland; Egan—Silty
Windbreak suitability group: Ethan—10; Egan—3
Pasture suitability group: Ethan—NS; Egan—F

FaA—Flandreau loam, 0 to 2 percent slopes

Composition

Flandreau and similar soils: 75 to 95 percent
Contrasting inclusions: 5 to 25 percent

Setting

Landform: Till plains
Position on the landform: Summits and backslopes
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 100 acres

Typical Profile

Surface layer:
0 to 7 inches—dark grayish brown loam

Subsoil:
7 to 15 inches—dark grayish brown loam
15 to 33 inches—yellowish brown loam
33 to 39 inches—yellowish brown sandy loam

Underlying layer:
39 to 78 inches—pale brown and light yellowish brown, calcareous loamy sand over stratified loamy fine sand and fine sandy loam; redoximorphic concentrations and depletions
78 to 80 inches—light yellowish brown, calcareous clay loam that has redoximorphic concentrations and depletions

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: 25 to 40 inches over sandy material over loamy glacial till at a depth of more than 60 inches
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderate in the loamy sediments, rapid in the underlying sandy material, and moderately slow in the underlying loamy glacial till
Available water capacity: Moderate
Content of organic matter: Moderate
Surface runoff class: Low

Inclusions

Contrasting inclusions:
- The moderately well drained Bonilla soils, which are dark to a depth of 20 inches or more; on footslopes
- The well drained Dobalt soils, which have loam or clay loam material within a depth of 40 inches; on summits and backslopes
- The somewhat excessively drained Thurman soils, which are sandy; on summits and shoulders

Similar inclusions:
- Soils that are dark to a depth of more than 20 inches
- Soils that contain less sand and more silt than the Flandreau soil

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: The restricted available water capacity; agrochemical leaching
Management considerations:
- This soil is better suited to early maturing crops, such as small grain, than to some other crops. Minimizing tillage and leaving crop residue on the surface conserve moisture.
- Including grasses and legumes in the rotation helps to control erosion and helps to maintain tilth and the content of organic matter.
- Irrigation helps to overcome the limited ability of the soil to store water if an adequate and dependable supply of water is available.
- Applying nitrogen close to the time when crops will use it reduces the amount of time available for leaching.

Interpretive Groups

Land capability classification: 2s
Range site: Silty
Windbreak suitability group: 3
Pasture suitability group: F

FaB—Flandreau loam, 2 to 6 percent slopes

Composition

Flandreau and similar soils: 75 to 90 percent
Contrasting inclusions: 10 to 25 percent

Setting

Landform: Till plains
Position on the landform: Summits and backslopes
Slope range: 2 to 6 percent
Shape of areas: Irregular
Size of areas: 15 to 100 acres

Typical Profile

Surface layer:
0 to 7 inches—dark grayish brown loam

Subsoil:
7 to 15 inches—dark grayish brown loam
15 to 33 inches—yellowish brown loam
33 to 39 inches—yellowish brown sandy loam

Underlying layer:
39 to 78 inches—pale brown and light yellowish brown, calcareous loamy sand over stratified loamy fine sand and fine sandy loam; redoximorphic concentrations and depletions
78 to 80 inches—light yellowish brown, calcareous clay loam that has redoximorphic concentrations and depletions

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: 25 to 40 inches over sandy material over loamy glacial till at a depth of more than 60 inches
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderate in the loamy sediments, rapid in the underlying sandy material, and moderately slow in the underlying loamy glacial till
Available water capacity: Moderate
Content of organic matter: Moderate
Surface runoff class: Medium

Inclusions

Contrasting inclusions:
- The moderately well drained Bonilla soils, which are dark to a depth of 20 inches or more; on footslopes
- The well drained Dobalt soils, which have loam or clay loam material within a depth of 40 inches; on summits and backslopes
- The somewhat excessively drained Thurman soils, which are sandy; on summits and shoulders

Similar inclusions:
- Soils that are dark to a depth of more than 20 inches
- Soils that contain less sand and more silt than the Flandreau soil

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Water erosion, the restricted available water capacity, and agrochemical leaching
Management considerations:
• This soil is better suited to early maturing crops, such as small grain, than to some other crops. Minimizing tillage and leaving crop residue on the surface conserve moisture.
• Contour farming helps to control water erosion.
• Including grasses and legumes in the rotation helps to control erosion and helps to maintain tilth and the content of organic matter.
• Irrigation helps to overcome the limited ability of the soil to store water if an adequate and dependable supply of water is available.
• Applying nitrogen close to the time when crops will use it reduces the amount of time available for leaching.

Interpretive Groups

Land capability classification: 2e
Range site: Silty
Windbreak suitability group: 3
Pasture suitability group: F

FtB—Flandreau-Thurman complex, 2 to 6 percent slopes

Composition

Flandreau and similar soils: 50 to 75 percent
Thurman and similar soils: 15 to 35 percent
Contrasting inclusions: 5 to 20 percent

Setting

Landform: Till plains
Position on the landform: Flandreau—backslopes; Thurman—shoulders
Slope range: 2 to 6 percent
Shape of areas: Irregular
Size of areas: 10 to 100 acres

Typical Profile

Flandreau

Surface layer:
0 to 7 inches—dark grayish brown loam

Subsoil:
7 to 15 inches—dark grayish brown loam
15 to 33 inches—yellowish brown loam
33 to 39 inches—yellowish brown sandy loam

Underlying layer:
39 to 78 inches—pale brown and light yellowish brown, calcareous loamy sand over stratified loamy fine sand and fine sandy loam; redoximorphic concentrations and depletions
78 to 80 inches—light yellowish brown, calcareous clay loam that has redoximorphic concentrations and depletions

Thurman

Surface layer:
0 to 6 inches—grayish brown fine sandy loam

Subsurface layer:
6 to 10 inches—grayish brown fine sandy loam

Transitional layer:
10 to 18 inches—dark yellowish brown fine sandy loam

Underlying layer:
18 to 70 inches—pale brown and light yellowish brown loamy fine sand and fine sand
70 to 80 inches—light yellowish brown, calcareous fine sand that has relict redoximorphic features

Soil Properties and Qualities

Drainage class: Flandreau—well drained; Thurman—somewhat excessively drained
Depth to bedrock: Very deep
Depth to contrasting parent material: Flandreau—25 to 40 inches over sandy material over loamy glacial till at a depth of more than 60 inches; Thurman—more than 60 inches
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Flandreau—moderate in the loamy sediments, rapid in the underlying sandy material, and moderately slow in the underlying loamy glacial till; Thurman—rapid
Available water capacity: Flandreau—moderate; Thurman—low
Content of organic matter: Flandreau—moderate; Thurman—moderately low
Surface runoff class: Flandreau—medium; Thurman—very low

Inclusions

Contrasting inclusions:
• The well drained Blendon soils, which are dark to a depth of 20 inches or more; on footslopes
• The well drained Henkin soils, which contain more

sand in surface layer and upper part of the subsoil than the Flandreau soil; on summits and backslopes
• The well drained Moody soils, which contain more silt and less sand than the major soils; on backslopes
• The well drained Crofton soils, which have more silt and less sand than the major soils and are calcareous at the surface; on shoulders

Similar inclusions:
• Soils that have a subsoil of loam or silt loam

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Fairly well suited
Management concerns: Water erosion, the restricted available water capacity, and agrochemical leaching
Management considerations:
• These soils are better suited to early maturing crops, such as small grain, than to some other crops. Minimizing tillage and leaving crop residue on the surface conserve moisture.
• Contour farming helps to control water erosion.
• Including grasses and legumes in the rotation helps to control erosion and helps to maintain tilth and the content of organic matter.
• Irrigation helps to overcome the limited ability of the soils to store water if an adequate and dependable supply of water is available.
• Applying nitrogen close to the time when crops will use it reduces the amount of time available for leaching.

Interpretive Groups

Land capability classification: Flandreau—2e; Thurman—4e
Range site: Flandreau—Silty; Thurman—Sandy
Windbreak suitability group: Flandreau—3; Thurman—5
Pasture suitability group: Flandreau—F; Thurman—H

GrA—Graceville silty clay loam, 0 to 2 percent slopes

Composition

Graceville and similar soils: 70 to 90 percent
Contrasting inclusions: 10 to 30 percent

Setting

Landform: Outwash plains
Position on the landform: Footslopes
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 10 to 300 acres

Typical Profile

Surface soil:
0 to 18 inches—very dark gray silty clay loam

Subsoil:
18 to 30 inches—dark gray silty clay loam
30 to 52 inches—light olive brown silty clay loam that has redoximorphic concentrations

Underlying layer:
52 to 80 inches—brown, calcareous gravelly sand

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: 40 to 60 inches over gravelly material
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderate in the silty sediments and very rapid in the underlying gravelly material
Available water capacity: High
Content of organic matter: Moderate
Surface runoff class: Low
Other properties: Runoff water flows over this soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
• The well drained Alcester and Davis soils, which do not have gravelly material within a depth of 60 inches; on footslopes
• The moderately well drained Bonilla soils, which have more sand and less silt in the subsoil than the Graceville soil; on footslopes
• The well drained Dempster soils, which are dark to a depth of less than 20 inches; on summits and backslopes
• The somewhat poorly drained Dimo soils on high flood plains
• The somewhat poorly drained Whitewood soils on toeslopes

Similar inclusions:
• Soils that have sand and gravel within a depth of 40 inches

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat

Suitability for crops: Well suited
Management concerns: Agrochemical leaching
Management considerations:
• Managing crop residue conserves moisture and helps to maintain tilth and the content of organic matter.

Interpretive Groups

Land capability classification: 1
Range site: Silty
Windbreak suitability group: 3
Pasture suitability group: F

GsB—Grovena loam, 2 to 6 percent slopes

Composition

Grovena and similar soils: 70 to 85 percent
Contrasting inclusions: 15 to 30 percent

Setting

Landform: Till plains
Position on the landform: Summits and backslopes
Slope range: 2 to 6 percent
Shape of areas: Irregular
Size of areas: 10 to 100 acres

Typical Profile

Surface layer:
0 to 9 inches—dark grayish brown loam

Subsoil:
9 to 13 inches—brown silt loam
13 to 24 inches—yellowish brown silt loam
24 to 30 inches—light yellowish brown loam
30 to 36 inches—light yellowish brown, calcareous loam

Underlying layer:
36 to 51 inches—light yellowish brown, calcareous sandy loam
51 to 80 inches—calcareous clay loam that is light yellowish brown in the upper part and very pale brown in the lower part; redoximorphic concentrations in the lower part

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 40 inches over loamy glacial till or sandy material
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderate
Available water capacity: High
Content of organic matter: Moderate
Surface runoff class: Medium

Inclusions

Contrasting inclusions:
• The well drained Davis soils and the moderately well drained Bonilla and Trent soils, which are dark to a depth of 20 inches or more; on footslopes
• The well drained Dobalt and Houdek soils, which have loam or clay loam glacial till within a depth of 20 to 40 inches; on backslopes
• The well drained Ihlen soils, which have unweathered bedrock within a depth of 40 inches; on backslopes and footslopes
• The somewhat poorly drained Whitewood soils on toeslopes

Similar inclusions:
• Soils that have more silt and less sand in the subsoil than the Grovena soil
• Soils that grade to sandy material within a depth of 40 inches

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Water erosion
Management considerations:
• Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture.
• Contour farming and grassed waterways help to control water erosion, but slopes in some areas are too short or too irregular for contour farming.
• Including grasses and legumes in the rotation helps to control erosion and helps to maintain tilth and the content of organic matter.

Interpretive Groups

Land capability classification: 2e
Range site: Silty
Windbreak suitability group: 3
Pasture suitability group: F

GvA—Grovena-Bonilla loams, 0 to 2 percent slopes

Composition

Grovena and similar soils: 55 to 80 percent
Bonilla and similar soils: 15 to 40 percent
Contrasting inclusions: 1 to 10 percent

Setting

Landform: Till plains
Position on the landform: Grovena—summits and backslopes; Bonilla—footslopes
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 15 to 100 acres

Typical Profile

Grovena

Surface layer:
0 to 9 inches—dark grayish brown loam

Subsoil:
9 to 13 inches—brown silt loam
13 to 24 inches—yellowish brown silt loam
24 to 30 inches—light yellowish brown loam
30 to 36 inches—light yellowish brown, calcareous loam

Underlying layer:
36 to 51 inches—light yellowish brown, calcareous sandy loam
51 to 80 inches—calcareous clay loam that is light yellowish brown in the upper part and very pale brown in the lower part; redoximorphic concentrations in the lower part

Bonilla

Surface soil:
0 to 11 inches—dark gray loam

Subsoil:
11 to 22 inches—dark gray clay loam
22 to 32 inches—light olive brown clay loam
32 to 45 inches—light yellowish brown, calcareous clay loam that has redoximorphic depletions

Underlying layer:
45 to 80 inches—light yellowish brown, calcareous, stratified silt loam that has redoximorphic depletions

Soil Properties and Qualities

Drainage class: Grovena—well drained; Bonilla—moderately well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: Grovena—more than 40 inches over loamy glacial till or sandy material; Bonilla—more than 60 inches
Depth to high water table: Grovena—more than 6 feet; Bonilla—3.5 to 5.0 feet
Flooding: None
Ponding: None
Permeability: Moderate
Available water capacity: High
Content of organic matter: Grovena—moderate; Bonilla—high
Surface runoff class: Low
Other properties: Runoff water flows over the Bonilla soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
- The well drained Dobalt soils, which have loam or clay loam glacial till within a depth of 20 to 40 inches; on backslopes
- The moderately well drained Trent soils, which have less sand and more silt than the major soils; on footslopes
- The somewhat poorly drained Whitewood soils on toeslopes

Similar inclusions:
- Soils that have more silt and less sand in the subsoil
- Soils that grade to sandy material within a depth of 40 inches

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Few limitations
Management considerations:
- Managing crop residue conserves moisture and helps to maintain tilth and the content of organic matter.

Interpretive Groups

Land capability classification: Grovena—1; Bonilla—1
Range site: Grovena—Silty; Bonilla—Loamy Overflow
Windbreak suitability group: Grovena—3; Bonilla—1
Pasture suitability group: Grovena—F; Bonilla—K

HoB—Houdek clay loam, 2 to 6 percent slopes

Composition

Houdek and similar soils: 75 to 85 percent
Contrasting inclusions: 15 to 25 percent

Setting

Landform: Till plains
Position on the landform: Summits and backslopes
Slope range: 2 to 6 percent
Shape of areas: Irregular
Size of areas: 5 to 100 acres

Typical Profile

Surface layer:
0 to 6 inches—dark gray clay loam

Subsoil:
6 to 17 inches—dark grayish brown clay loam
17 to 22 inches—grayish brown, calcareous clay loam
22 to 33 inches—light yellowish brown, calcareous clay loam that has redoximorphic depletions

Underlying layer:
33 to 71 inches—light yellowish brown, calcareous clay loam that has redoximorphic concentrations and depletions
71 to 80 inches—light yellowish brown, calcareous clay loam with strata of sand; redoximorphic concentrations and depletions

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Content of organic matter: Moderate
Surface runoff class: Medium

Inclusions

Contrasting inclusions:
- The well drained Davis soils, which are dark to a depth of 20 inches or more; on footslopes
- The well drained Grovena and Shindler soils, which do not have an increase in clay content in the subsoil; on shoulders and backslopes
- The well drained Splitrock soils, which have less sand and more silt in the subsoil than the Houdek soil; on backslopes
- The well drained Henkin soils, which have less clay than the Houdek soil; on shoulders and backslopes
- The somewhat poorly drained Whitewood soils on toeslopes

Similar inclusions:
- Soils that have less clay in the subsoil than the Houdek soil

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Water erosion
Management considerations:
- Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture.
- Contour farming and grassed waterways help to control water erosion, but slopes in some areas are too short or too irregular for contour farming.
- Including grasses and legumes in the rotation helps to control erosion and helps to maintain tilth and the content of organic matter.

Interpretive Groups

Land capability classification: 2e
Range site: Silty
Windbreak suitability group: 3
Pasture suitability group: F

HsC—Houdek-Shindler clay loams, 6 to 9 percent slopes

Composition

Houdek and similar soils: 55 to 75 percent
Shindler and similar soils: 10 to 30 percent
Contrasting inclusions: 5 to 25 percent

Setting

Landform: Moraines
Position on the landform: Houdek—backslopes; Shindler—shoulders
Slope range: 6 to 9 percent
Shape of areas: Irregular
Size of areas: 15 to 100 acres

Typical Profile

Houdek

Surface layer:
0 to 6 inches—dark gray clay loam

Subsoil:
6 to 17 inches—dark grayish brown clay loam
17 to 22 inches—grayish brown, calcareous clay loam
22 to 33 inches—light yellowish brown, calcareous clay loam that has redoximorphic depletions

Underlying layer:
33 to 71 inches—light yellowish brown, calcareous clay loam that has redoximorphic concentrations and depletions
71 to 80 inches—light yellowish brown, calcareous clay loam with strata of sand; redoximorphic concentrations and depletions

Shindler

Surface layer:
0 to 8 inches—dark gray, calcareous clay loam

Subsoil:
8 to 14 inches—gray and light yellowish brown, calcareous clay loam
14 to 59 inches—light yellowish brown, calcareous clay loam that has relict redoximorphic features

Underlying layer:
59 to 80 inches—pale yellow, calcareous clay loam that has relict redoximorphic features

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Content of organic matter: Houdek—moderate; Shindler—moderately low
Surface runoff class: Houdek—medium; Shindler—high
Other properties: The Shindler soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The well drained Blendon, Davis, and Enet soils, which are dark to a depth of 20 inches or more; on footslopes
• The well drained Flandreau soils, which grade to sandy material within a depth of 40 inches; on backslopes
• The moderately well drained Trent soils on footslopes
• The somewhat poorly drained Whitewood soils on toeslopes

Similar inclusions:
• Soils that have less clay in the subsoil than the Houdek soil

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Fairly well suited
Management concerns: Houdek—water erosion; Shindler—wind erosion, water erosion, and the high content of lime, which adversely affects the availability of plant nutrients
Management considerations:
• Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture.
• Contour farming, terraces, and grassed waterways help to control water erosion, but slopes in most areas are too short or too irregular for contour farming or terraces.
• Wind stripcropping and field windbreaks help to control wind erosion.
• Including grasses and legumes in the rotation helps to control erosion and helps to maintain the content of organic matter, fertility, and tilth.

Interpretive Groups

Land capability classification: Houdek—3e; Shindler—4e
Range site: Houdek—Silty; Shindler—Silty
Windbreak suitability group: Houdek—3; Shindler—8
Pasture suitability group: Houdek—F; Shindler—G

HsD—Houdek-Shindler clay loams, 9 to 15 percent slopes

Composition

Houdek and similar soils: 45 to 70 percent
Shindler and similar soils: 15 to 30 percent
Contrasting inclusions: 15 to 25 percent

Setting

Landform: Moraines
Position on the landform: Houdek—backslopes; Shindler—shoulders
Slope range: 9 to 15 percent
Shape of areas: Irregular
Size of areas: 10 to 100 acres

Typical Profile

Houdek

Surface layer:
0 to 6 inches—dark gray clay loam

Subsoil:
6 to 17 inches—dark grayish brown clay loam
17 to 22 inches—grayish brown, calcareous clay loam
22 to 33 inches—light yellowish brown, calcareous clay loam that has redoximorphic depletions

Underlying layer:
33 to 71 inches—light yellowish brown, calcareous clay loam that has redoximorphic concentrations and depletions

71 to 80 inches—light yellowish brown, calcareous clay loam with strata of sand; redoximorphic concentrations and depletions

Shindler

Surface layer:
0 to 8 inches—dark gray, calcareous clay loam

Subsoil:
8 to 14 inches—gray and light yellowish brown, calcareous clay loam
14 to 59 inches—light yellowish brown, calcareous clay loam that has relict redoximorphic features

Underlying layer:
59 to 80 inches—pale yellow, calcareous clay loam that has relict redoximorphic features

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Content of organic matter: Houdek—moderate; Shindler—moderately low
Surface runoff class: Houdek—high; Shindler—very high
Other properties: The Shindler soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The moderately well drained Bonilla soils on footslopes
• The somewhat poorly drained Whitewood soils on toeslopes
• The well drained Corson soils, which have more clay than the major soils; on backslopes
• The somewhat excessively drained Delmont soils, which have gravelly material within a depth of 20 inches; on shoulders
• The well drained Henkin soils, which have less clay in the subsoil than the major soils; on shoulders and backslopes
• The well drained Flandreau soils, which grade to sandy material within a depth of 40 inches; on backslopes

Similar inclusions:
• Soils that have less clay in the subsoil than the Houdek soil

Use and Management

Cropland and pasture

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Poorly suited
Management concerns: Houdek—water erosion; Shindler—wind erosion, water erosion, and the high content of lime, which adversely affects the availability of plant nutrients
Management considerations:
• Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture.
• Contour farming, terraces, and grassed waterways help to control water erosion, but slopes in most areas are too short or too irregular for contour farming or terraces.
• Wind stripcropping and field windbreaks help to control wind erosion.
• Including grasses and legumes in the rotation helps to control erosion and helps to maintain the content of organic matter, fertility, and tilth.
• Establishing permanent pasture or hayland species helps to control erosion.
• Proper grazing management helps to maintain plant vigor and control erosion.

Interpretive Groups

Land capability classification: Houdek—4e; Shindler—6e
Range site: Houdek—Silty; Shindler—Silty
Windbreak suitability group: Houdek—3; Shindler—8
Pasture suitability group: Houdek—F; Shindler—G

HtD—Houdek-Talmo complex, 9 to 15 percent slopes

Composition

Houdek and similar soils: 25 to 55 percent
Talmo and similar soils: 20 to 50 percent
Contrasting inclusions: 15 to 30 percent

Setting

Landform: Moraines
Position on the landform: Houdek—backslopes; Talmo—summits and shoulders
Slope range: 9 to 15 percent
Shape of areas: Irregular
Size of areas: 10 to 100 acres

Typical Profile

Houdek

Surface layer:
0 to 6 inches—dark gray clay loam

Subsoil:
6 to 17 inches—dark grayish brown clay loam
17 to 22 inches—grayish brown, calcareous clay loam
22 to 33 inches—light yellowish brown, calcareous clay loam that has redoximorphic depletions

Underlying layer:
33 to 71 inches—light yellowish brown, calcareous clay loam that has redoximorphic concentrations and depletions
71 to 80 inches—light yellowish brown, calcareous clay loam with strata of sand; redoximorphic concentrations and depletions

Talmo

Surface layer:
0 to 7 inches—very dark gray, calcareous gravelly loam

Underlying layer:
7 to 15 inches—grayish brown, calcareous very gravelly loamy sand
15 to 80 inches—pale brown and grayish brown, calcareous very gravelly sand

Soil Properties and Qualities

Drainage class: Houdek—well drained; Talmo—excessively drained
Depth to bedrock: Very deep
Depth to contrasting parent material: Houdek—more than 60 inches; Talmo—0 to 14 inches over gravelly material
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Houdek—moderately slow; Talmo—very rapid
Available water capacity: Houdek—high; Talmo—very low
Content of organic matter: Houdek—moderate; Talmo—moderately low
Surface runoff class: Houdek—high; Talmo—low
Other properties: The Talmo soil has a high content of lime.

Inclusions

Contrasting inclusions:
- The moderately well drained Bonilla soils and the well drained Davis soils, which are dark to a depth of 20 inches or more; on footslopes
- The somewhat excessively drained Delmont soils, which have gravelly material at a depth of 14 to 20 inches; on backslopes
- The well drained Dempster and Enet soils, which have gravelly material at a depth of 20 to 40 inches; on backslopes and footslopes
- The well drained Shindler soils, which are calcareous within a depth of 8 inches; on shoulders
- The well drained Splitrock soils, which have more silt and less sand than the Houdek soil; on summits and backslopes
- The somewhat poorly drained Chaska soils on low flood plains

Similar inclusions:
- Soils that have less clay in the subsoil than the Houdek soil

Use and Management

Cropland and pasture

Suitability for crops: Generally unsuited
Management concerns: Houdek—water erosion; Talmo—the restricted available water capacity and the high content of lime, which adversely affects the availability of plant nutrients
Management considerations:
- Proper grazing management helps to maintain plant vigor, conserves moisture, and helps to control erosion.

Interpretive Groups

Land capability classification: Houdek—4e; Talmo—6e
Range site: Houdek—Silty; Talmo—Very Shallow
Windbreak suitability group: Houdek—3; Talmo—10
Pasture suitability group: Houdek—F; Talmo—NS

HuA—Huntimer silty clay loam, 0 to 2 percent slopes

Composition

Huntimer and similar soils: 75 to 95 percent
Contrasting inclusions: 5 to 25 percent

Setting

Landform: Ice-walled lake plains
Position on the landform: Summits
Slope range: 0 to 2 percent
Shape of areas: Oval
Size of areas: 15 to 100 acres

Typical Profile

Surface layer:
0 to 7 inches—dark grayish brown silty clay loam

Subsoil:
7 to 12 inches—dark grayish brown silty clay
12 to 18 inches—brown silty clay

18 to 26 inches—light olive brown, calcareous silty clay loam that has relict redoximorphic features
26 to 38 inches—light yellowish brown, calcareous silty clay loam that has redoximorphic concentrations and depletions

Underlying layer:
38 to 50 inches—light brownish gray, calcareous silty clay loam that has redoximorphic concentrations and depletions
50 to 80 inches—light gray, calcareous silty clay loam that has varves of silt loam and fine sand in the lower part; redoximorphic concentrations and depletions

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 40 inches over loamy glacial till
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Slow
Available water capacity: High
Content of organic matter: Moderate
Surface runoff class: Medium

Inclusions

Contrasting inclusions:
- The moderately well drained Benclare and Bonilla soils on footslopes
- The somewhat poorly drained Chancellor soils on toeslopes
- The well drained Egan soils, which have less clay than the Huntimer soil; on summits and backslopes
- The poorly drained Tetonka soils in shallow basins

Similar inclusions:
- Soils that have more clay in the subsoil than the Huntimer soil

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Few limitations
Management considerations:
- Managing crop residue conserves moisture and helps to maintain tilth and the content of organic matter.

Interpretive Groups

Land capability classification: 1
Range site: Silty
Windbreak suitability group: 3
Pasture suitability group: F

HuB—Huntimer silty clay loam, 2 to 6 percent slopes

Composition

Huntimer and similar soils: 75 to 90 percent
Contrasting inclusions: 10 to 25 percent

Setting

Landform: Ice-walled lake plains
Position on the landform: Summits and backslopes
Slope range: 2 to 6 percent
Shape of areas: Irregular
Size of areas: 10 to 100 acres

Typical Profile

Surface layer:
0 to 7 inches—dark grayish brown silty clay loam

Subsoil:
7 to 12 inches—dark grayish brown silty clay
12 to 18 inches—brown silty clay
18 to 26 inches—light olive brown, calcareous silty clay loam that has relict redoximorphic features
26 to 38 inches—light yellowish brown, calcareous silty clay loam that has redoximorphic concentrations and depletions

Underlying layer:
38 to 50 inches—light brownish gray, calcareous silty clay loam that has redoximorphic concentrations and depletions
50 to 80 inches—light gray, calcareous silty clay loam that has varves of silt loam and fine sand in the lower part; redoximorphic concentrations and depletions

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 40 inches over loamy glacial till
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Slow
Available water capacity: High
Content of organic matter: Moderate
Surface runoff class: High

Inclusions

Contrasting inclusions:
• The moderately well drained Benclare soils on footslopes
• The well drained Egan and Wentworth soils, which have less clay than the Huntimer soil; on summits and backslopes
• The well drained Ethan soils, which are calcareous at a depth of 5 inches or less and have less clay than the Huntimer soil; on shoulders
• The very poorly drained Worthing soils in basins

Similar inclusions:
• Soils that have more clay in the subsoil than the Huntimer soil

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Water erosion
Management considerations:
• Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture.
• Contour farming, terraces, and grassed waterways help to control water erosion, but slopes in some areas are too short or too irregular for contour farming or terraces.
• Including grasses and legumes in the rotation helps to control erosion and helps to maintain tilth and the content of organic matter.

Interpretive Groups

Land capability classification: 2e
Range site: Silty
Windbreak suitability group: 3
Pasture suitability group: F

IhA—Ihlen silty clay loam, 0 to 2 percent slopes

Composition

Ihlen and similar soils: 75 to 95 percent
Contrasting inclusions: 5 to 25 percent

Setting

Landform: Dissected plains
Position on the landform: Footslopes
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 15 to 100 acres

Typical Profile

Surface soil:
0 to 11 inches—dark gray silty clay loam

Subsoil:
11 to 17 inches—grayish brown silty clay loam
17 to 25 inches—pale brown silty clay loam
25 to 35 inches—light yellowish brown silt loam that has relict redoximorphic features

Bedrock:
35 inches—reddish brown, unweathered Sioux quartzite

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Moderately deep
Depth to contrasting parent material: 20 to 40 inches over unweathered Sioux quartzite
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderate in the loess and very slow in the underlying Sioux quartzite
Available water capacity: Moderate
Content of organic matter: Moderate
Surface runoff class: Low

Inclusions

Contrasting inclusions:
• The well drained Graceville soils, which are dark to a depth of 20 inches or more and have gravelly material at a depth of 40 to 60 inches; on footslopes
• The well drained Moody soils, which do not have bedrock within a depth of 40 inches; on backslopes
• The moderately well drained Trent soils on footslopes
• The poorly drained Tetonka soils in shallow basins
• Outcrops of unweathered bedrock on shoulders and footslopes

Similar inclusions:
• Soils that are dark to a depth of more than 20 inches
• Soils that have unweathered bedrock at a depth of less than 20 inches
• Soils that have more sand and less silt than the Ihlen soil

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Fairly well suited

Management concerns: The restricted available water capacity and the limited depth to bedrock
Management considerations:
• This soil is better suited to early maturing crops, such as small grain, than to some other crops. Minimizing tillage and leaving crop residue on the surface conserve moisture.
• Including grasses and legumes in the rotation helps to control erosion and helps to maintain tilth and the content of organic matter.

Interpretive Groups

Land capability classification: 2s
Range site: Silty
Windbreak suitability group: 6D
Pasture suitability group: F

IrB—Ihlen-Rock outcrop complex, 0 to 4 percent slopes

Composition

Ihlen and similar soils: 45 to 70 percent
Rock outcrop: 15 to 35 percent
Contrasting inclusions: 10 to 25 percent

Setting

Landform: Dissected plains
Position on the landform: Backslopes and footslopes
Slope range: 0 to 4 percent
Shape of areas: Irregular
Size of areas: 15 to 100 acres

Typical Profile

Ihlen

Surface soil:
0 to 11 inches—dark gray silty clay loam

Subsoil:
11 to 17 inches—grayish brown silty clay loam
17 to 25 inches—pale brown silty clay loam
25 to 35 inches—light yellowish brown silt loam that has relict redoximorphic features

Underlying layer:
35 inches—reddish brown, unweathered Sioux quartzite

Properties and Qualities

Drainage class: Ihlen—well drained; Rock outcrop—excessively drained
Depth to bedrock: Ihlen—moderately deep
Depth to contrasting parent material: Ihlen—20 to 40 inches over unweathered Sioux quartzite
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Ihlen—moderate in the loess and very slow in the underlying Sioux quartzite; Rock outcrop—very slow
Available water capacity: Ihlen—moderate; Rock outcrop—very low
Content of organic matter: Ihlen—moderate; Rock outcrop—very low
Surface runoff class: Ihlen—medium; Rock outcrop—high

Inclusions

Contrasting inclusions:
• The well drained Grovena and Flandreau soils, which have more sand and less silt than the Ihlen soil and do not have bedrock within a depth of 40 inches; on backslopes
• The well drained Davis soils, which are dark at a depth of 20 or more inches and do not have bedrock within a depth of 40 inches; on footslopes
• The well drained Moody soils, which do not have bedrock within a depth of 40 inches; on backslopes
• The moderately well drained Trent soils on footslopes
• The somewhat poorly drained Whitewood soils on toeslopes

Similar inclusions:
• Soils that are dark to a depth of more than 20 inches
• Soils that have unweathered bedrock at a depth of less than 20 inches
• Soils that have more sand and less silt than the Ihlen soil

Use and Management

Rangeland

Suitability for crops: Generally unsuited
Management concerns: Ihlen—the restricted available water capacity, water erosion, and the limited depth to Sioux quartzite bedrock; Rock outcrop—the restricted available water capacity and a very slow rate of water infiltration
Management considerations:
• Proper grazing management helps to maintain plant vigor, conserves moisture, and helps to control erosion.

Interpretive Groups

Land capability classification: Ihlen—2e; Rock outcrop—8s
Range site: Ihlen—Silty; Rock outcrop—not assigned
Windbreak suitability group: Ihlen—6D; Rock outcrop—10
Pasture suitability group: Ihlen—F; Rock outcrop—NS

IrE—Ihlen-Rock outcrop complex, 4 to 35 percent slopes

Composition

Ihlen and similar soils: 35 to 60 percent
Rock outcrop: 25 to 50 percent
Contrasting inclusions: 5 to 20 percent

Setting

Landform: Dissected plains (fig. 8)
Position on the landform: Shoulders, backslopes, and footslopes
Slope range: Ihlen—4 to 25 percent; Rock outcrop—9 to 35 percent
Shape of areas: Irregular
Size of areas: 10 to 100 acres

Typical Profile

Ihlen

Surface soil:
0 to 11 inches—dark gray silty clay loam

Subsoil:
11 to 17 inches—grayish brown silty clay loam
17 to 25 inches—pale brown silty clay loam
25 to 35 inches—light yellowish brown silt loam that has relict redoximorphic features

Figure 8.—An area of Ihlen-Rock outcrop complex, 4 to 35 percent slopes, along Split Rock Creek. The rock is Sioux quartzite.

Underlying layer:
35 inches—reddish brown, unweathered Sioux quartzite

Properties and Qualities

Drainage class: Ihlen—well drained; Rock outcrop—excessively drained
Depth to bedrock: Ihlen—moderately deep
Depth to contrasting parent material: Ihlen—20 to 40 inches over unweathered Sioux quartzite
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Ihlen—moderate in the loess and very slow in the underlying Sioux quartzite; Rock outcrop—very slow
Available water capacity: Ihlen—moderate; Rock outcrop—very low
Content of organic matter: Ihlen—moderate; Rock outcrop—very low
Surface runoff class: Ihlen—high; Rock outcrop—very high
Other properties: The bedrock includes escarpments in some areas.

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Chaska soils on low flood plains
- The moderately well drained Davis soils on high flood plains
- The well drained Grovena and Moody soils, which do not have bedrock within a depth of 40 inches; on backslopes
- The moderately well drained Trent soils on footslopes

Similar inclusions:
- Soils that are dark to a depth of more than 20 inches
- Soils that have unweathered bedrock at a depth of less than 20 inches
- Soils that have more sand and less silt than the Ihlen soil

Use and Management

Rangeland and recreation

Suitability for crops: Generally unsuited
Management concerns: Ihlen—the restricted available water capacity, water erosion, and the limited depth to bedrock; Rock outcrop—the restricted available water capacity and a very slow rate of water infiltration

Management considerations:
- Proper grazing management helps to maintain plant vigor, conserves moisture, and helps to control erosion.

Interpretive Groups

Land capability classification: Ihlen—4e; Rock outcrop—8s
Range site: Ihlen—Silty; Rock outcrop—not assigned
Windbreak suitability group: Ihlen—6D; Rock outcrop—10
Pasture suitability group: Ihlen—F; Rock outcrop—NS

Ja—Janude fine sandy loam, 0 to 2 percent slopes

Composition

Janude and similar soils: 85 to 99 percent
Contrasting inclusions: 1 to 15 percent

Setting

Landform: High flood plains
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 15 to 180 acres

Typical Profile

Surface layer:
0 to 19 inches—dark gray fine sandy loam

Transitional layer:
19 to 43 inches—dark grayish brown, calcareous fine sandy loam

Underlying layer:
43 to 57 inches—grayish brown, calcareous fine sandy loam
57 to 80 inches—grayish brown, calcareous silty clay loam that has redoximorphic concentrations

Soil Properties and Qualities

Drainage class: Moderately well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 40 inches over loamy glacial till
Depth to high water table: 4 to 6 feet
Frequency of flooding: Rare
Ponding: None
Permeability: Moderate
Available water capacity: Moderate

Content of organic matter: Moderate
Surface runoff class: Low

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Chaska soils on low flood plains
• The poorly drained Clamo soils, which have more clay than the Janude soil; on low flood plains
• The somewhat poorly drained Lamo soils, which have more clay and silt than the Janude soil; on low flood plains

Similar inclusions:
• Soils that are leached to a depth of more than 30 inches

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: The restricted available water capacity; wind erosion
Management considerations:
• Minimizing tillage, leaving crop residue on the surface, and including grasses and legumes in the cropping system help to control erosion, conserve moisture, and help to maintain the content of organic matter.
• Wind stripcropping and field windbreaks help to control wind erosion.

Interpretive Groups

Land capability classification: 2s
Range site: Sandy
Windbreak suitability group: 1
Pasture suitability group: H

La—Lamo silty clay loam, 0 to 1 percent slopes

Composition

Lamo and similar soils: 75 to 80 percent
Contrasting inclusions: 20 to 25 percent

Setting

Landform: Low flood plains
Slope range: 0 to 1 percent
Shape of areas: Irregular
Size of areas: 10 to 500 acres

Typical Profile

Surface layer:
0 to 7 inches—gray silty clay loam

Subsurface layer:
7 to 30 inches—grayish brown and dark gray, calcareous silt loam and silty clay loam

Transitional layer:
30 to 43 inches—dark gray, calcareous silty clay loam

Subsoil:
43 to 64 inches—light gray, calcareous silty clay loam that has redoximorphic concentrations

Underlying layer:
64 to 80 inches—light gray, calcareous silty clay loam that has strata of fine sandy loam and very fine sandy loam and has redoximorphic concentrations

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
Depth to high water table: 1 to 3 feet
Flooding: Occasional for brief periods
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Content of organic matter: Moderately low
Surface runoff class: Low
Other properties: This soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The moderately well drained Alcester soils on high flood plains
• The poorly drained Clamo soils on low flood plains
• The moderately well drained Bon soils, which have more sand and less silt than the Lamo soil; on high flood plains
• The somewhat poorly drained Chaska soils, which have more sand and less silt than the Lamo soil; on low flood plains
• The somewhat poorly drained Whitewood soils, which are not calcareous within a depth of 30 inches; on toeslopes

Similar inclusions:
• Soils that are more poorly drained than the Lamo soil

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Flooding, high water table, wind erosion, and the high content of lime, which adversely affects the availability of plant nutrients
Management considerations:
• Leaving crop residue on the surface and deferring tillage when the soil is wet help to maintain tilth, minimize soil compaction, and help to control erosion.
• Including grasses and legumes in the rotation helps to control erosion and helps to maintain the content of organic matter, fertility, and tilth.
• Maintaining existing drainage systems helps to remove excess water.

Interpretive Groups

Land capability classification: 2w
Range site: Subirrigated
Windbreak suitability group: 2K
Pasture suitability group: A

Lb—Lamo silty clay loam, channeled

Composition

Lamo and similar soils: 70 to 80 percent
Contrasting inclusions: 20 to 30 percent

Setting

Landform: Low flood plains
Slope range: 0 to 1 percent
Shape of areas: Long and narrow
Size of areas: 15 to 800 acres

Typical Profile

Surface layer:
0 to 7 inches—gray silty clay loam

Subsurface layer:
7 to 30 inches—grayish brown and dark gray, calcareous silt loam and silty clay loam

Transitional layer:
30 to 43 inches—dark gray, calcareous silty clay loam

Subsoil:
43 to 64 inches—light gray, calcareous silty clay loam that has redoximorphic concentrations

Underlying layer:
64 to 80 inches—light gray, calcareous silty clay loam that has strata of fine sandy loam and very fine sandy loam and has redoximorphic concentrations

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
Depth to high water table: 1 to 3 feet
Flooding: Frequent for brief periods
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Content of organic matter: Moderate
Surface runoff class: Low
Other properties: This soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The very poorly drained Baltic soils, which contain more clay in the subsoil than the Lamo soil; on low flood plains and in basins
• The moderately well drained Bon soils, which have more sand and less silt than the Lamo soil; on high flood plains
• The somewhat poorly drained Chancellor soils, which have more clay in the subsoil than the Lamo soil and are leached to a depth of more than 28 inches; on toeslopes
• The somewhat poorly drained Chaska soils, which contain more sand and less silt than the Lamo soil; on low flood plains

Similar inclusions:
• Soils that have stratification in the upper 10 inches
• Soils that are more poorly drained than the Lamo soil

Use and Management

Rangeland

Suitability for crops: Generally unsuited
Management concerns: Flooding, high water table, meandering channels that limit cultivation, and the high content of lime, which adversely affects the availability of plant nutrients
Management considerations:
• Proper grazing management helps to maintain plant vigor and control streambank erosion.

• Cultivated areas should be seeded to adapted grasses.
• Restricting grazing during wet periods can minimize soil compaction.

Interpretive Groups

Land capability classification: 6w
Range site: Subirrigated
Windbreak suitability group: 2K
Pasture suitability group: NS

M-W—Miscellaneous water

• This map unit consists of small manmade areas that are used for industrial, sanitary, or mining applications and that contain water most of the year.

MdB—Moody silty clay loam, 2 to 6 percent slopes

Composition

Moody and similar soils: 75 to 85 percent
Contrasting inclusions: 15 to 25 percent

Setting

Landform: Plains
Position on the landform: Summits and backslopes
Slope range: 2 to 6 percent
Shape of areas: Irregular
Size of areas: 15 to 300 acres

Typical Profile

Surface soil:
0 to 11 inches—very dark grayish brown silty clay loam

Subsoil:
11 to 24 inches—brown silty clay loam
24 to 35 inches—light olive brown silty clay loam
35 to 50 inches—light yellowish brown, calcareous silt loam that has relict redoximorphic features

Underlying layer:
50 to 80 inches—light yellowish brown, calcareous silt loam that has redoximorphic depletions

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 40 inches over loamy glacial till or sandy material
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderate
Available water capacity: High
Content of organic matter: Moderate
Surface runoff class: Medium

Inclusions

Contrasting inclusions:
• The well drained Alcester soils, which are dark to a depth of 24 inches or more; on footslopes
• The somewhat poorly drained, clayey Chancellor soils on toeslopes
• The somewhat poorly drained, silty Whitewood soils on toeslopes
• The moderately well drained Trent soils and the moderately well drained, calcareous Wakonda soils on footslopes

Similar inclusions:
• Soils that are calcareous at a depth of 12 to 30 inches
• Soils that have more sand and less silt than the Moody soil
• Soils that have glacial till at a depth of 20 to 40 inches

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Water erosion
Management considerations:
• Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture.
• Contour farming and grassed waterways help to control water erosion.
• Including grasses and legumes in the rotation helps to control erosion and helps to maintain tilth and the content of organic matter.

Interpretive Groups

Land capability classification: 2e
Range site: Silty
Windbreak suitability group: 3
Pasture suitability group: F

MgA—Moody-Gayville complex, 0 to 3 percent slopes

Composition

Moody and similar soils: 25 to 50 percent
Gayville and similar soils: 25 to 50 percent
Contrasting inclusions: 10 to 30 percent

Setting

Landform: Plains and flood plains
Position on the landform: Moody—summits and backslopes; Gayville—high flood plains
Slope range: Moody—0 to 3 percent; Gayville—0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 20 acres

Typical Profile

Moody

Surface soil:
0 to 11 inches—very dark grayish brown silty clay loam

Subsoil:
11 to 24 inches—brown silty clay loam
24 to 35 inches—light olive brown silty clay loam
35 to 50 inches—light yellowish brown, calcareous silt loam that has relict redoximorphic features

Underlying layer:
50 to 80 inches—light yellowish brown, calcareous silt loam that has redoximorphic depletions

Gayville

Surface layer:
0 to 2 inches—gray silt loam

Subsoil:
2 to 7 inches—dark gray silty clay
7 to 13 inches—grayish brown silty clay
13 to 26 inches—light yellowish brown, calcareous silty clay loam

Underlying layer:
26 to 51 inches—pale yellow, calcareous clay loam that has redoximorphic depletions
51 to 80 inches—light brownish gray, calcareous loam over loamy very fine sand; redoximorphic concentrations and depletions

Soil Properties and Qualities

Drainage class: Moody—well drained; Gayville—somewhat poorly drained
Depth to bedrock: Very deep
Depth to contrasting parent material: Moody—more than 40 inches over loamy glacial till or sandy material; Gayville—9 to 30 inches over loamy alluvium
Depth to high water table: Moody—more than 6 feet; Gayville—2 to 4 feet
Flooding: Moody—none; Gayville—rare
Ponding: None
Permeability: Moody—moderate; Gayville—very slow
Available water capacity: Moody—high; Gayville—moderate
Content of organic matter: Moderate
Surface runoff class: Moody—low; Gayville—medium
Other properties: The Gayville soil has a sodium-affected subsoil.

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Chancellor soils, which do not have a sodium-affected subsoil; on toeslopes
• The well drained Corson soils, which have more clay than the Moody soil; on summits and backslopes
• The moderately well drained Trent soils on footslopes
• The moderately well drained, calcareous Wakonda soils on footslopes

Similar inclusions:
• Soils that are calcareous at a depth of 12 to 30 inches
• Soils that have an increase in clay content in the subsoil and are not sodium affected

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Fairly well suited
Management concerns: Moody—slight; Gayville—the sodium-affected subsoil (which adversely affects plant growth by restricting root penetration) and a slow rate of water infiltration
Management considerations:
• Leaving crop residue on the surface, minimizing tillage, tilling in a timely manner, and including grasses and legumes in the cropping system help to control erosion, conserve moisture, and help to maintain tilth and the content of organic matter.
• Chiseling or subsoiling when the soils are dry increases the rate of water infiltration.
• Proper grazing management on rangeland helps to maintain plant vigor.
• Restricted grazing during wet periods can minimize soil compaction.

Interpretive Groups

Land capability classification: Moody—1; Gayville—6s
Range site: Moody—Silty; Gayville—Saline Lowland
Windbreak suitability group: Moody—3; Gayville—9W
Pasture suitability group: Moody—F; Gayville—J

MnB—Moody-Nora silty clay loams, 2 to 6 percent slopes

Composition

Moody and similar soils: 30 to 55 percent
Nora and similar soils: 20 to 40 percent
Contrasting inclusions: 10 to 25 percent

Setting

Landform: Plains
Position on the landform: Moody—summits and backslopes; Nora—shoulders
Slope range: 2 to 6 percent
Shape of areas: Irregular
Size of areas: 20 to 800 acres

Typical Profile

Moody

Surface soil:
0 to 11 inches—very dark grayish brown silty clay loam

Subsoil:
11 to 24 inches—brown silty clay loam
24 to 35 inches—light olive brown silty clay loam
35 to 50 inches—light yellowish brown, calcareous silt loam that has relict redoximorphic features

Underlying layer:
50 to 80 inches—light yellowish brown, calcareous silt loam that has redoximorphic depletions

Nora

Surface layer:
0 to 9 inches—grayish brown silty clay loam

Subsoil:
9 to 22 inches—pale brown silty clay loam
22 to 32 inches—pale brown, calcareous silt loam
32 to 54 inches—pale brown, calcareous silt loam that has relict redoximorphic features

Underlying layer:
54 to 80 inches—light yellowish brown, calcareous silt loam that has redoximorphic concentrations and depletions

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 40 inches over loamy glacial till or sandy material
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderate
Available water capacity: High
Content of organic matter: Moderate
Surface runoff class: Medium

Inclusions

Contrasting inclusions:
- The well drained Alcester soils, which are dark to a depth of 24 inches or more; on footslopes
- The well drained Crofton soils, which are calcareous throughout; on summits and shoulders
- The somewhat poorly drained Chancellor soils on toeslopes
- The moderately well drained Trent soils and the moderately well drained, calcareous Wakonda soils on footslopes
- The somewhat poorly drained Whitewood soils on toeslopes

Similar inclusions:
- Soils that have more sand and less silt
- Soils that have glacial till at a depth of 20 to 40 inches
- Soils that have an increase in clay content in the subsoil

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Water erosion (fig. 9)
Management considerations:
- Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture.
- Contour farming and grassed waterways help to control water erosion, but slopes in some areas are too short or too irregular for contour farming.
- Including grasses and legumes in the rotation helps to control erosion and helps to maintain tilth and the content of organic matter.

Interpretive Groups

Land capability classification: Moody—2e; Nora—2e
Range site: Moody—Silty; Nora—Silty
Windbreak suitability group: Moody—3; Nora—3
Pasture suitability group: Moody—F; Nora—F

MnC—Moody-Nora silty clay loams, 6 to 9 percent slopes

Composition

Moody and similar soils: 45 to 70 percent
Nora and similar soils: 15 to 30 percent
Contrasting inclusions: 10 to 25 percent

Figure 9.—Terraces help to control erosion in an area of Moody-Nora silty clay loams, 2 to 6 percent slopes.

Setting

Landform: Plains
Position on the landform: Moody—backslopes; Nora—summits and shoulders
Slope range: 6 to 9 percent
Shape of areas: Irregular
Size of areas: 15 to 100 acres

Typical Profile

Moody

Surface soil:
0 to 11 inches—very dark grayish brown silty clay loam

Subsoil:
11 to 24 inches—brown silty clay loam
24 to 35 inches—light olive brown silty clay loam
35 to 50 inches—light yellowish brown, calcareous silt loam that has relict redoximorphic features

Underlying layer:
50 to 80 inches—light yellowish brown, calcareous silt loam that has redoximorphic depletions

Nora

Surface layer:
0 to 9 inches—grayish brown silty clay loam

Subsoil:
9 to 22 inches—pale brown silty clay loam
22 to 32 inches—pale brown, calcareous silt loam
32 to 54 inches—pale brown, calcareous silt loam that has relict redoximorphic features

Underlying layer:
54 to 80 inches—light yellowish brown, calcareous silt loam that has redoximorphic concentrations and depletions

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 40 inches over loamy glacial till or sandy material
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderate

Available water capacity: High
Content of organic matter: Moderate
Surface runoff class: Medium

Inclusions

Contrasting inclusions:
• The well drained Alcester soils, which are dark to a depth of 24 inches or more; on footslopes
• The well drained Crofton soils, which are calcareous throughout; on summits and shoulders
• The somewhat poorly drained Chancellor soils on toeslopes
• The moderately well drained Trent soils and the moderately well drained, calcareous Wakonda soils on footslopes
• The somewhat poorly drained Whitewood soils on toeslopes

Similar inclusions:
• Soils that have more sand and less silt
• Soils that have glacial till at a depth of 20 to 40 inches

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Fairly well suited
Management concerns: Water erosion
Management considerations:
• Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture.
• Contour farming, terraces, and grassed waterways help to control water erosion, but slopes in some areas are too short or too irregular for contour farming or terraces.
• Including grasses and legumes in the rotation helps to control erosion and helps to maintain tilth and the content of organic matter.

Interpretive Groups

Land capability classification: Moody—3e; Nora—3e
Range site: Moody—Silty; Nora—Silty
Windbreak suitability group: Moody—3; Nora—3
Pasture suitability group: Moody—F; Nora—F

MtA—Moody-Trent silty clay loams, 0 to 2 percent slopes

Composition

Moody and similar soils: 35 to 60 percent
Trent and similar soils: 30 to 55 percent
Contrasting inclusions: 1 to 15 percent

Setting

Landform: Plains
Position on the landform: Moody—summits and backslopes; Trent—footslopes
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 15 to 900 acres

Typical Profile

Moody

Surface soil:
0 to 11 inches—very dark grayish brown silty clay loam

Subsoil:
11 to 24 inches—brown silty clay loam
24 to 35 inches—light olive brown silty clay loam
35 to 50 inches—light yellowish brown, calcareous silt loam that has relict redoximorphic features

Underlying layer:
50 to 80 inches—light yellowish brown, calcareous silt loam that has redoximorphic depletions

Trent

Surface soil:
0 to 15 inches—dark gray silty clay loam

Subsoil:
15 to 23 inches—dark grayish brown silty clay loam
23 to 28 inches—pale brown silty clay loam
28 to 46 inches—brown silty clay loam and silt loam; redoximorphic concentrations in the upper part and redoximorphic concentrations and depletions in the lower part
46 to 52 inches—light brownish gray, calcareous silt loam that has redoximorphic concentrations and depletions

Underlying layer:
52 to 80 inches—light brownish gray, calcareous silt loam that has redoximorphic concentrations and depletions

Soil Properties and Qualities

Drainage class: Moody—well drained; Trent—moderately well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: Moody—more than 40 inches over loamy glacial till or sandy material; Trent—more than 40 inches over loamy glacial till
Depth to high water table: Moody—more than 6 feet; Trent—3.5 to 5.0 feet
Flooding: None

Ponding: None
Permeability: Moderate
Available water capacity: High
Content of organic matter: Moody—moderate; Trent—high
Surface runoff class: Low
Other properties: Runoff water flows over the Trent soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
• The somewhat poorly drained, clayey Chancellor soils on toeslopes
• The moderately well drained Wakonda soils, which are calcareous throughout; on footslopes
• The somewhat poorly drained Whitewood soils on toeslopes

Similar inclusions:
• Soils that are calcareous at a depth of 12 to 30 inches
• Soils that have more sand and less silt

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Few limitations
Management considerations:
• Managing crop residue conserves moisture and helps to maintain tilth and the content of organic matter.

Interpretive Groups

Land capability classification: Moody—1; Trent—1
Range site: Moody—Silty; Trent—Loamy Overflow
Windbreak suitability group: Moody—3; Trent—1
Pasture suitability group: Moody—F; Trent—K

NcC—Nora-Crofton complex, 6 to 9 percent slopes

Composition

Nora and similar soils: 40 to 65 percent
Crofton and similar soils: 15 to 40 percent
Contrasting inclusions: 10 to 25 percent

Setting

Landform: Dissected plains
Position on the landform: Nora—backslopes; Crofton—shoulders (fig. 10)
Slope range: 6 to 9 percent
Shape of areas: Irregular
Size of areas: 15 to 600 acres

Typical Profile

Nora

Surface layer:
0 to 9 inches—grayish brown silty clay loam

Subsoil:
9 to 22 inches—pale brown silty clay loam
22 to 32 inches—pale brown, calcareous silt loam
32 to 54 inches—pale brown, calcareous silt loam that has relict redoximorphic features

Underlying layer:
54 to 80 inches—light yellowish brown, calcareous silt loam that has redoximorphic concentrations and depletions

Crofton

Surface layer:
0 to 6 inches—light brownish gray, calcareous silt loam

Transitional layer:
6 to 14 inches—pale brown, calcareous silt loam

Underlying layer:
14 to 40 inches—light yellowish brown, calcareous silt loam that has relict redoximorphic features
40 to 80 inches—very pale brown, calcareous silt loam that has relict redoximorphic features

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: Nora—more than 40 inches over loamy glacial till or sandy material; Crofton—more than 60 inches
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderate
Available water capacity: High
Content of organic matter: Nora—moderate; Crofton—low
Surface runoff class: Medium
Other properties: The Crofton soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The well drained Alcester soils, which are dark to a depth of 24 inches or more; on footslopes

Figure 10.—An area of Nora-Crofton complex, 6 to 9 percent slopes. The Crofton soil is in the lighter colored areas on shoulders. The Nora soil is darker and is on backslopes.

• The well drained Flandreau and Grovena soils, which have more sand and less silt than the major soils; on summits and backslopes
• The somewhat excessively drained Thurman soils on summits and shoulders
• The somewhat poorly drained Whitewood soils on toeslopes
• The moderately well drained Trent and Wakonda soils on footslopes

Similar inclusions:
• Soils that are not calcareous within a depth of 30 inches

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Fairly well suited
Management concerns: Nora—water erosion; Crofton—wind erosion, water erosion, and the high content of lime, which adversely affects the availability of plant nutrients
Management considerations:
• Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture.

• Contour farming, terraces, and grassed waterways help to control water erosion, but slopes in some areas are too short or too irregular for contour farming or terraces.
• Wind stripcropping and field windbreaks help to control wind erosion.
• Including grasses and legumes in the rotation helps to control wind erosion and water erosion and helps to maintain the content of organic matter, fertility, and tilth.

Interpretive Groups

Land capability classification: Nora—3e; Crofton—4e
Range site: Nora—Silty; Crofton—Thin Upland
Windbreak suitability group: Nora—3; Crofton—8
Pasture suitability group: Nora—F; Crofton—G

Ob—Obert silty clay loam, 0 to 1 percent slopes

Composition

Obert and similar soils: 90 to 99 percent
Contrasting inclusions: 1 to 10 percent

Setting

Landform: Low flood plains
Slope range: 0 to 1 percent
Shape of areas: Long and narrow
Size of areas: 10 to 100 acres

Typical Profile

Surface layer:
0 to 6 inches—gray, calcareous silty clay loam

Subsurface layer:
6 to 40 inches—dark gray, calcareous silty clay loam that has redoximorphic concentrations in the upper part

Transitional layer:
40 to 52 inches—gray, calcareous silty clay loam

Underlying layer:
52 to 65 inches—gray, calcareous silty clay loam that has redoximorphic concentrations in the upper part and redoximorphic concentrations and depletions in the lower part
65 to 80 inches—gray, calcareous silty clay loam that has strata of sand and gravel and has redoximorphic concentrations and depletions

Soil Properties and Qualities

Drainage class: Very poorly drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
High water table: 0.5 foot above to 1 foot below the surface
Flooding: Frequent for brief periods
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Content of organic matter: Moderate
Surface runoff class: Very low
Other properties: This soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The very poorly drained Baltic soils, which have more clay than the Obert soil; on low flood plains and in basins
• The somewhat poorly drained Chaska soils on low flood plains

Similar inclusions:
• Soils that are better drained than the Obert soil

Use and Management

Rangeland and pasture

Suitability for crops: Generally unsuited
Management concerns: Flooding, high water table, and the high content of lime, which adversely affects the availability of plant nutrients
Management considerations:
• Proper grazing management helps to maintain plant vigor.
• Restricting grazing when the soil is wet helps to prevent soil compaction.

Interpretive Groups

Land capability classification: 5w
Range site: Wetland
Windbreak suitability group: 10
Pasture suitability group: B1

Og—Orthents, gravelly

Composition

Orthents and similar soils: 90 to 99 percent
Contrasting inclusions: 1 to 10 percent

Setting

Landform: Outwash plains
Position on the landform: Summits, shoulders, backslopes, footslopes, and toeslopes
Slope range: 0 to 60 percent

Shape of areas: Irregular
Size of areas: 10 to 140 acres

Typical Profile

Surface soil:
0 to 18 inches—yellowish brown, calcareous gravelly sandy loam

Underlying layer:
18 to 80 inches—yellowish brown, calcareous gravelly loamy sand

Soil Properties and Qualities

Drainage class: Excessively drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderately rapid to very rapid
Available water capacity: Very low
Content of organic matter: Low
Surface runoff class: Very low or low

Inclusions

Contrasting inclusions:
• Aquents in areas where gravel has been removed to a depth at the level of the water table
• The well drained Dempster soils, which have 20 to 40 inches of silty material over sand and gravel; on backslopes and summit remnants
• The well drained Graceville soils, which are dark to a depth of more than 20 inches and have more than 40 inches of silty material over sand and gravel; on footslope remnants
• Orthents that do not have sand and gravel; in areas where sand and gravel have been removed and loamy or silty underlying material has been exposed

Use and Management

Rangeland and wildlife habitat

Suitability for crops: Unsuited
Management concerns: Slope
Management considerations:
• This map unit consists of areas from which gravel has been excavated and removed. In some areas that have been reclaimed, a few inches of loamy material has been replaced on the surface. Some areas have also been used as landfills prior to reclamation.
• Abandoned areas can be restored to range, tame pasture, or cropland if reclamation measures are applied. Reclamation measures include shaping the areas and using the mounds of overburden material as topsoil dressing.
• Applying fertilizer as needed helps to establish range or tame pasture plants.

Interpretive Groups

Land capability classification: 8s
Range site: Very Shallow
Windbreak suitability group: 10
Pasture suitability group: NS

Or—Orthents, loamy

Composition

Orthents and similar soils: 80 to 95 percent
Contrasting inclusions: 5 to 20 percent

Setting

Landform: Till plains and plains
Position on the landform: Summits, shoulders, backslopes, and footslopes
Slope range: 0 to 15 percent
Shape of areas: Irregular
Size of areas: 10 to 100 acres

Typical Profile

Surface layer:
0 to 6 inches—dark gray and brown, calcareous clay loam

Transitional layer:
6 to 15 inches—pale brown and dark gray, mottled, calcareous clay loam

Underlying layer:
15 to 80 inches—light yellowish brown and pale yellow, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Content of organic matter: Moderately low
Surface runoff class: Low to high

Inclusions

Contrasting inclusions:
• The well drained Moody and Nora soils, which are

not calcareous within a depth of 12 inches; on remnants of summits, backslopes, and shoulders
- The well drained Crofton soils, which have a surface layer that has not been mixed with the underlying material; on remnants of shoulders and backslopes
- The well drained, loamy Houdek soils, which are not calcareous within a depth of 18 inches; on summits and backslopes
- The gravelly Orthents in areas where material has been removed and gravelly underlying material has been exposed

Use and Management

Cropland and pasture

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Poorly suited
Management concerns: Water erosion, wind erosion, and limited fertility
Management considerations:
- This map unit includes loamy and silty borrow areas and other cut and fill areas. Most areas are reclaimed. An area west of Wall Lake was used as a site for settling ponds during the Wall Lake restoration project.
- Minimizing tillage, leaving crop residue on the surface, and including grasses and legumes in the cropping system help to control erosion, improve fertility, and conserve moisture.
- Seeding cultivated areas to adapted grasses helps to control erosion.

Interpretive Groups

Land capability classification: 4e
Range site: Thin Upland
Windbreak suitability group: 8
Pasture suitability group: G

Ow—Orthents-Aquents complex, gravelly

Composition

Orthents and similar soils: 45 to 70 percent
Aquents and similar soils: 25 to 50 percent
Contrasting inclusions: 1 to 15 percent

Setting

Landform: Outwash plains
Position on the landform: Orthents—summits, shoulders, and backslopes; Aquents—toeslopes
Slope range: Orthents—0 to 60 percent; Aquents—0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 200 acres

Typical Profile

Orthents

Surface soil:
0 to 18 inches—yellowish brown, calcareous gravelly sandy loam

Underlying layer:
18 to 80 inches—yellowish brown, calcareous gravelly loamy sand

Aquents

Surface layer:
0 to 8 inches—light brownish gray and yellowish brown, calcareous gravelly loam

Underlying layer:
8 to 80 inches—pale brown, calcareous gravelly loamy sand

Soil Properties and Qualities

Drainage class: Orthents—excessively drained; Aquents—very poorly drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
High water table: Orthents—at a depth of more than 6 feet; Aquents—2 feet above to 2 feet below the surface
Flooding: None
Ponding: Orthents—none; Aquents—frequent for very long periods
Permeability: Orthents—moderately rapid to very rapid; Aquents—rapid
Available water capacity: Very low
Content of organic matter: Orthents—low; Aquents—moderately low
Surface runoff class: Orthents—very low or low; Aquents—very low
Other properties: The Aquents are at or below the level of the water table during some periods.

Inclusions

Contrasting inclusions:
- The somewhat excessively drained Delmont soils, which have 14 to 20 inches of loamy material over sand and gravel; on remnants of shoulders and backslopes
- The well drained Enet soils, which have 20 to 40 inches of loamy material over sand and gravel; on footslope remnants
- The well drained Dempster soils, which have 20 to 40 inches of silty material over sand and gravel; on remnants of summits and backslopes
- The well drained Graceville soils, which are dark to a depth of more than 20 inches and have more than 40

inches of silty material over sand and gravel; on footslope remnants
• Orthents that do not have sand and gravel; in areas where sand and gravel have been removed and loamy or silty underlying material has been exposed

Use and Management

Rangeland and wildlife habitat

Suitability for crops: Unsuited
Management concerns: Slope and wetness
Management considerations:
• This map unit consists of areas from which gravel has been excavated and removed. In some areas that have been reclaimed, a few inches of loamy material has been replaced on the surface. Some areas have also been used as landfills prior to reclamation.
• Abandoned areas can be restored to range, tame pasture, or cropland if reclamation measures are applied. Reclamation measures include shaping the areas and using the mounds of overburden material as topsoil dressing.
• Applying fertilizer as needed helps to establish range or tame pasture plants.

Interpretive Groups

Land capability classification: Orthents—8s; Aquents—5w
Range site: Orthents—Very Shallow; Aquents—Wetland
Windbreak suitability group: Orthents—10; Aquents—10
Pasture suitability group: Orthents—NS; Aquents—NS

Pt—Pits, quarry

Composition

Pits, quarry: 85 to 99 percent
Contrasting inclusions: 1 to 15 percent

Setting

Landform: Terraces and flood plains
Position on the landform: Shoulders, backslopes, footslopes, and toeslopes
Slope range: 0 to 90 percent
Shape of areas: Irregular
Size of areas: 10 to 150 acres

Typical Profile

0 to 80 inches—reddish brown, unweathered Sioux quartzite bedrock

Soil Properties and Qualities

Drainage class: Excessively drained
Depth to bedrock: Very shallow
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Very slow
Available water capacity: Very low
Content of organic matter: Very low
Surface runoff class: Medium to very high

Inclusions

Contrasting inclusions:
• The well drained Ihlen soils, which are silty to a depth of 20 to 40 inches; on backslopes
• The gravelly or loamy Orthents in areas where gravelly or loamy material has been disturbed or deposited during or following quarry operations
• Areas where surface water or ground water has filled parts of a quarry

Use and Management

Wildlife habitat

Suitability for crops: Unsuited
Management considerations:
• This map unit includes active and inactive Sioux quartzite quarries. Some areas may be reclaimed and have crushed rock and other debris on the surface. Deep inactive pits may fill with water.

Interpretive Groups

Land capability classification: 8s
Range site: Not assigned
Windbreak suitability group: 10
Pasture suitability group: NS

Sa—Salmo silty clay loam, 0 to 1 percent slopes

Composition

Salmo and similar soils: 70 to 80 percent
Contrasting inclusions: 20 to 30 percent

Setting

Landform: Low flood plains
Slope range: 0 to 1 percent
Shape of areas: Elongated or irregular
Size of areas: 5 to 100 acres

Typical Profile

Surface layer:
0 to 5 inches—very dark gray, calcareous silty clay loam that has accumulations of salt and has redoximorphic concentrations

Subsoil:
5 to 17 inches—very dark gray, calcareous silty

clay loam that has accumulations of salt and has redoximorphic concentrations

17 to 41 inches—dark gray, calcareous silty clay loam that has accumulations of salt and has redoximorphic concentrations

41 to 49 inches—dark gray, calcareous clay loam that has accumulations of gypsum and has redoximorphic concentrations

Underlying layer:

49 to 59 inches—light brownish gray, calcareous sandy loam that has redoximorphic concentrations

59 to 80 inches—grayish brown, calcareous sandy loam that has redoximorphic concentrations in the upper part and redoximorphic concentrations and depletions in the lower part

Soil Properties and Qualities

Drainage class: Poorly drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 40 inches over gravelly material
High water table: At the surface to 1.5 feet below the surface
Flooding: Frequent for brief periods
Ponding: None
Permeability: Moderately slow in the silty alluvium and moderately rapid in the underlying loamy sediments
Available water capacity: Moderate
Content of organic matter: High
Surface runoff class: Very low
Other properties: This soil has a high content of salts and lime.

Inclusions

Contrasting inclusions:

- The very poorly drained Baltic soils, which have more clay than the Salmo soil; on low flood plains and in basins
- The somewhat poorly drained Chancellor and Whitewood soils on toeslopes
- The moderately well drained Wakonda soils on footslopes
- The somewhat poorly drained Lamo soils on low flood plains
- The very poorly drained Worthing soils, which have more clay in the subsoil than the Salmo soil; in basins

Similar inclusions:

- Soils that have a stratified surface layer
- Soils that contain more sand and less silt than the Salmo soil

Use and Management

Cropland and pasture

Main crops: Barley, corn, oats, soybeans, and spring wheat
Suitability for crops: Poorly suited
Management concerns: Flooding, high water table, salinity, wind erosion, and the high content of lime, which adversely affects the availability of plant nutrients
Management considerations:

- In most years this soil is better suited to late-planted crops than to some other crops.
- Leaving crop residue on the surface and deferring tillage when the soil is wet help to maintain tilth, minimize surface compaction, and help to control wind erosion.
- Permanent pasture and hayland species should be established.

Interpretive Groups

Land capability classification: 4w
Range site: Saline Subirrigated
Windbreak suitability group: 10
Pasture suitability group: J

SdE—Shindler-Houdek clay loams, 15 to 40 percent slopes

Composition

Shindler and similar soils: 35 to 60 percent
Houdek and similar soils: 10 to 30 percent
Contrasting inclusions: 5 to 30 percent

Setting

Landform: Moraines
Position on the landform: Shindler—shoulders; Houdek—backslopes
Slope range: Shindler—15 to 40 percent; Houdek—15 to 25 percent
Shape of areas: Irregular or elongated
Size of areas: 10 to 80 acres

Typical Profile

Shindler

Surface layer:

0 to 8 inches—dark gray, calcareous clay loam

Subsoil:

8 to 14 inches—gray and light yellowish brown, calcareous clay loam

14 to 59 inches—light yellowish brown, calcareous clay loam that has relict redoximorphic features

Underlying layer:
59 to 80 inches—pale yellow, calcareous clay loam that has relict redoximorphic features

Houdek

Surface layer:
0 to 6 inches—dark gray clay loam

Subsoil:
6 to 17 inches—dark grayish brown clay loam
17 to 22 inches—grayish brown, calcareous clay loam
22 to 33 inches—light yellowish brown, calcareous clay loam that has redoximorphic depletions

Underlying layer:
33 to 71 inches—light yellowish brown, calcareous clay loam that has redoximorphic concentrations and depletions
71 to 80 inches—light yellowish brown, calcareous clay loam that has strata of sand and has redoximorphic concentrations and depletions

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Content of organic matter: Shindler—moderately low; Houdek—moderate
Surface runoff class: Shindler—very high; Houdek—high
Other properties: The Shindler soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The well drained Crofton soils, which have more silt and less sand than the Shindler soil; on summits and shoulders
• The well drained Davis soils, which are dark at a depth of 20 inches or more; on footslopes
• The well drained Nora soils, which have more silt and less sand than the Houdek soil; on summits and shoulders
• The somewhat poorly drained Chaska soils on low flood plains
• The excessively drained Thurman soils on summits and shoulders
• The somewhat poorly drained Whitewood soils on toeslopes

Similar inclusions:
• Soils that do not have an increase of clay content in the subsoil and are not calcareous within a depth of 14 inches

Use and Management

Rangeland

Suitability for crops: Generally unsuited
Management concerns: Water erosion
Management considerations:
• Proper grazing management helps to maintain plant vigor, conserves moisture, and helps to control erosion.

Interpretive Groups

Land capability classification: Shindler—7e; Houdek—6e
Range site: Shindler—Silty; Houdek—Silty
Windbreak suitability group: Shindler—10; Houdek—10
Pasture suitability group: Shindler—NS; Houdek—NS

SnE—Shindler-Talmo complex, 15 to 40 percent slopes

Composition

Shindler and similar soils: 30 to 55 percent
Talmo and similar soils: 25 to 45 percent
Contrasting inclusions: 10 to 25 percent

Setting

Landform: Moraines
Position on the landform: Shindler—backslopes; Talmo—shoulders
Slope range: 15 to 40 percent
Shape of areas: Irregular
Size of areas: 5 to 80 acres

Typical Profile

Shindler

Surface layer:
0 to 8 inches—dark gray, calcareous clay loam

Subsoil:
8 to 14 inches—gray and light yellowish brown, calcareous clay loam
14 to 59 inches—light yellowish brown, calcareous clay loam that has relict redoximorphic features

Underlying layer:
59 to 80 inches—pale yellow, calcareous clay loam that has relict redoximorphic features

Talmo

Surface layer:
0 to 7 inches—very dark gray, calcareous gravelly loam

Underlying layer:
7 to 15 inches—grayish brown, calcareous very gravelly loamy sand
15 to 80 inches—pale brown and grayish brown, calcareous very gravelly sand

Soil Properties and Qualities

Drainage class: Shindler—well drained; Talmo—excessively drained
Depth to bedrock: Very deep
Depth to contrasting parent material: Shindler—more than 60 inches; Talmo—0 to 14 inches over gravelly material
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Shindler—moderately slow; Talmo—very rapid
Available water capacity: Shindler—high; Talmo—very low
Content of organic matter: Moderately low
Surface runoff class: Shindler—very high; Talmo—medium
Other properties: The Shindler soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The well drained Blendon and Davis soils, which are dark to a depth of more than 20 inches; on footslopes
• The well drained Crofton soils, which have more silt and less sand than the Shindler soil; on summits and shoulders
• The well drained Dempster soils, which have 20 to 40 inches of silty material over sand and gravel; on summits
• The somewhat poorly drained Whitewood soils on toeslopes

Similar inclusions:
• Soils that contain less gravel than the Talmo soil

Use and Management

Rangeland

Suitability for crops: Generally unsuited
Management concerns: Shindler—water erosion; Talmo—the restricted available water capacity
Management considerations:
• Proper grazing management helps to maintain plant vigor, conserves moisture, and helps to control erosion.

Interpretive Groups

Land capability classification: Shindler—7e; Talmo—7e
Range site: Shindler—Silty; Talmo—Very Shallow
Windbreak suitability group: Shindler—10; Talmo—10
Pasture suitability group: Shindler—NS; Talmo—NS

SpA—Splitrock silty clay loam, 0 to 2 percent slopes

Composition

Splitrock and similar soils: 80 to 95 percent
Contrasting inclusions: 5 to 20 percent

Setting

Landform: Till plains
Position on the landform: Summits and backslopes
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 10 to 100 acres

Typical Profile

Surface layer:
0 to 9 inches—dark gray silty clay loam

Subsoil:
9 to 19 inches—brown silty clay loam
19 to 34 inches—pale brown silty clay loam
34 to 51 inches—pale yellow, calcareous clay loam that has redoximorphic depletions

Underlying layer:
51 to 66 inches—pale yellow, calcareous clay loam that has redoximorphic concentrations and depletions
66 to 80 inches—light yellowish brown, calcareous clay loam that has redoximorphic concentrations and depletions

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: 20 to 40 inches over loamy glacial till
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High

Content of organic matter: Moderate
Surface runoff class: Low

Inclusions

Contrasting inclusions:
• The well drained Dobalt soils, which have more sand and less silt than the Splitrock soil; on summits and backslopes
• The well drained Flandreau soils, which grade to sandy material within a depth of 40 inches and do not have till within a depth of 40 inches; on summits and backslopes
• The moderately well drained Trent soils on footslopes
• The somewhat poorly drained Whitewood soils on toeslopes

Similar inclusions:
• Soils that do not have glacial till within a depth of 40 inches

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Few limitations
Management considerations:
• Managing crop residue conserves moisture and helps to maintain tilth and the content of organic matter.

Interpretive Groups

Land capability classification: 1
Range site: Silty
Windbreak suitability group: 3
Pasture suitability group: F

SpB—Splitrock silty clay loam, 2 to 6 percent slopes

Composition

Splitrock and similar soils: 75 to 95 percent
Contrasting inclusions: 5 to 25 percent

Setting

Landform: Till plains
Position on the landform: Summits and backslopes
Slope range: 2 to 6 percent
Shape of areas: Irregular
Size of areas: 10 to 400 acres

Typical Profile

Surface layer:
0 to 9 inches—dark gray silty clay loam

Subsoil:
9 to 19 inches—brown silty clay loam
19 to 34 inches—pale brown silty clay loam
34 to 51 inches—pale yellow, calcareous clay loam that has redoximorphic depletions

Underlying layer:
51 to 66 inches—pale yellow, calcareous clay loam that has redoximorphic concentrations and depletions
66 to 80 inches—light yellowish brown, calcareous clay loam that has redoximorphic concentrations and depletions

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: 20 to 40 inches over loamy glacial till
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Content of organic matter: Moderate
Surface runoff class: Medium

Inclusions

Contrasting inclusions:
• The well drained Dobalt soils, which have more sand and less silt than the Splitrock soil; on summits and backslopes
• The well drained Flandreau soils, which grade to sandy material within a depth of 40 inches and do not have till within a depth of 40 inches; on summits and backslopes
• The well drained Corson soils, which have more clay in the subsoil than the Splitrock soil; on backslopes
• The moderately well drained Trent soils on footslopes
• The somewhat poorly drained Whitewood soils on toeslopes

Similar inclusions:
• Soils that do not have glacial till within a depth of 40 inches

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Water erosion
Management considerations:
• Minimizing tillage and leaving crop residue on

the surface help to control erosion and conserve moisture.

- Contour farming and grassed waterways help to control water erosion, but slopes in some areas are too irregular for contour farming.
- Including grasses and legumes in the rotation helps to control erosion and helps to maintain tilth and the content of organic matter.

Interpretive Groups

Land capability classification: 2e
Range site: Silty
Windbreak suitability group: 3
Pasture suitability group: F

SsF—Steinauer-Shindler clay loams, 25 to 60 percent slopes

Composition

Steinauer and similar soils: 25 to 50 percent
Shindler and similar soils: 20 to 45 percent
Contrasting inclusions: 15 to 30 percent

Setting

Landform: Moraines (fig. 11)
Position on the landform: Steinauer—shoulders; Shindler—backslopes
Slope range: Steinauer—25 to 60 percent; Shindler—25 to 40 percent
Shape of areas: Irregular or elongated
Size of areas: 10 to 80 acres

Typical Profile

Steinauer

Surface layer:
0 to 4 inches—grayish brown, calcareous clay loam

Transitional layer:
4 to 13 inches—grayish brown and light brownish gray, calcareous clay loam that has relict redoximorphic features

Underlying layer:
13 to 43 inches—light yellowish brown and light brownish gray, calcareous clay loam that has relict redoximorphic features

Figure 11.—The deciduous trees in the foreground are in an area of Steinauer-Shindler clay loams, 25 to 60 percent slopes. The open field in the center is an area of Alcester silty clay loam, 0 to 2 percent slopes. The trees along the river in the background are in an area of Chaska loam, channeled.

43 to 80 inches—light yellowish brown, calcareous clay loam that has relict redoximorphic features

Shindler

Surface layer:
0 to 8 inches—dark gray, calcareous clay loam

Subsoil:
8 to 14 inches—gray and light yellowish brown, calcareous clay loam
14 to 59 inches—light yellowish brown, calcareous clay loam that has relict redoximorphic features

Underlying layer:
59 to 80 inches—pale yellow, calcareous clay loam that has relict redoximorphic features

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Content of organic matter: Steinauer—low; Shindler—moderately low
Surface runoff class: Very high
Other properties: Both soils have a high content of lime.

Inclusions

Contrasting inclusions:
- The well drained Alcester soils, which are dark to a depth of 24 inches or more; on footslopes
- The somewhat poorly drained Chaska soils on low flood plains
- The well drained Crofton and Nora soils, which have more silt and less sand than the major soils; on summits and shoulders
- The well drained Davis soils, which are dark to a depth of 20 inches or more; on footslopes

Similar inclusions:
- Soils that contain less clay

Use and Management

Rangeland

Suitability for crops: Unsuited
Management concerns: Water erosion and the high content of lime, which adversely affects the availability of plant nutrients
Management considerations:
- Proper grazing management helps to maintain plant vigor, conserves moisture, and helps to control erosion.

Interpretive Groups

Land capability classification: Steinauer—7e; Shindler—7e
Range site: Steinauer—Thin Upland; Shindler—Silty
Windbreak suitability group: Steinauer—10; Shindler—10
Pasture suitability group: Steinauer—NS; Shindler—NS

TdE—Talmo-Delmont complex, 15 to 40 percent slopes

Composition

Talmo and similar soils: 25 to 50 percent
Delmont and similar soils: 25 to 50 percent
Contrasting inclusions: 10 to 30 percent

Setting

Landform: Moraines
Position on the landform: Talmo—shoulders; Delmont—backslopes
Slope range: Talmo—15 to 40 percent; Delmont—15 to 25 percent
Shape of areas: Irregular
Size of areas: 10 to 50 acres

Typical Profile

Talmo

Surface layer:
0 to 7 inches—very dark gray, calcareous gravelly loam

Underlying layer:
7 to 15 inches—grayish brown, calcareous very gravelly loamy sand
15 to 80 inches—pale brown and grayish brown, calcareous very gravelly sand

Delmont

Surface layer:
0 to 8 inches—very dark gray loam

Subsoil:
8 to 15 inches—very dark gray loam

Underlying layer:
15 to 73 inches—grayish brown and light brownish gray, calcareous gravelly loamy sand and gravelly sand
73 to 80 inches—light gray, calcareous sand

Soil Properties and Qualities

Drainage class: Talmo—excessively drained; Delmont—somewhat excessively drained
Depth to bedrock: Very deep
Depth to contrasting parent material: Talmo—0 to 14 inches over gravelly material; Delmont—14 to 20 inches over gravelly material
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Talmo—very rapid; Delmont—moderate in the loamy sediments and very rapid in the underlying gravelly material
Available water capacity: Talmo—very low; Delmont—low
Content of organic matter: Talmo—moderately low; Delmont—moderate
Surface runoff class: Talmo—medium; Delmont—high

Inclusions

Contrasting inclusions:
- The moderately well drained Bonilla soils on footslopes
- The somewhat excessively drained Thurman soils, which do not have gravel in the underlying material; on summits and shoulders
- The well drained Corson soils, which have more clay than the major soils; on backslopes in areas near Beaver and Splitrock Creeks
- The well drained Henkin soils, which have less gravel than the Delmont soil; on summits and backslopes
- The well drained Shindler soils, which do not have sand and gravel in the subsoil; on the lower backslopes

Similar inclusions:
- Soils that contain less gravel
- Soils that contain more silt and less sand than the Delmont soil

Use and Management

Rangeland

Suitability for crops: Unsuited
Management concerns: Delmont—the restricted available water capacity, water erosion, and agrochemical leaching; Talmo—the restricted available water capacity, water erosion, agrochemical leaching, and the high content of lime, which adversely affects the availability of plant nutrients
Management considerations:
- Proper grazing management helps to maintain plant vigor, conserves moisture, and helps to control erosion.

Interpretive Groups

Land capability classification: Talmo—7e; Delmont—6e
Range site: Talmo—Very Shallow; Delmont—Shallow to Gravel
Windbreak suitability group: Talmo—10; Delmont—10
Pasture suitability group: Talmo—NS; Delmont—NS

Te—Tetonka silt loam, 0 to 1 percent slopes

Composition

Tetonka and similar soils: 80 to 95 percent
Contrasting inclusions: 5 to 20 percent

Setting

Landform: Till plains
Position on the landform: Basins
Slope range: 0 to 1 percent
Shape of areas: Oval
Size of areas: 5 to 10 acres

Typical Profile

Surface layer:
0 to 7 inches—dark gray silt loam

Subsurface layer:
7 to 16 inches—gray silt loam that has redoximorphic concentrations

Transitional layer:
16 to 20 inches—gray silt loam and silty clay that have redoximorphic concentrations

Subsoil:
20 to 45 inches—gray silty clay that has redoximorphic concentrations
45 to 60 inches—light brownish gray silty clay that has redoximorphic concentrations and depletions

Underlying layer:
60 to 80 inches—light brownish gray clay loam that has redoximorphic concentrations and depletions

Soil Properties and Qualities

Drainage class: Poorly drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
High water table: 1 foot above to 1 foot below the surface

Flooding: None
Ponding: Frequent for long periods
Permeability: Slow
Available water capacity: High
Content of organic matter: High
Surface runoff class: Negligible

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Chancellor and Crossplain soils on toeslopes
• The moderately well drained Wakonda soils, which are calcareous within a depth of 6 inches; on footslopes
• The very poorly drained Worthing soils in basins

Use and Management

Cropland

Main crops: Corn, soybeans
Suitability for crops: Poorly suited
Management concerns: Ponding, high water table
Management considerations:
• This soil is better suited to late-planted crops than to some other crops.
• Deferring tillage when the soil is wet helps to maintain tilth and minimize surface compaction.
• Practices that reduce runoff from adjacent soils help to control wetness.
• Maintaining existing drainage systems helps to remove excess water.

Interpretive Groups

Land capability classification: 4w
Range site: Wet Meadow
Windbreak suitability group: 10
Pasture suitability group: B2

TfC—Thurman-Flandreau complex, 6 to 9 percent slopes

Composition

Thurman and similar soils: 20 to 45 percent
Flandreau and similar soils: 20 to 45 percent
Contrasting inclusions: 20 to 30 percent

Setting

Landform: Till plains
Position on the landform: Thurman—shoulders and backslopes; Flandreau—backslopes
Slope range: 6 to 9 percent
Shape of areas: Irregular
Size of areas: 20 to 100 acres

Typical Profile

Thurman

Surface layer:
0 to 6 inches—grayish brown fine sandy loam

Subsurface layer:
6 to 10 inches—grayish brown fine sandy loam

Transitional layer:
10 to 18 inches—dark yellowish brown fine sandy loam

Underlying layer:
18 to 70 inches—pale brown and light yellowish brown loamy fine sand and fine sand
70 to 80 inches—light yellowish brown, calcareous fine sand that has relict redoximorphic features

Flandreau

Surface layer:
0 to 7 inches—dark grayish brown loam

Subsoil:
7 to 15 inches—dark grayish brown loam
15 to 33 inches—yellowish brown loam
33 to 39 inches—yellowish brown sandy loam

Underlying layer:
39 to 78 inches—pale brown and light yellowish brown, calcareous loamy sand over stratified loamy fine sand and fine sandy loam; redoximorphic concentrations and depletions
78 to 80 inches—light yellowish brown, calcareous clay loam that has redoximorphic concentrations and depletions

Soil Properties and Qualities

Drainage class: Thurman—somewhat excessively drained; Flandreau—well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: Thurman—more than 60 inches; Flandreau—25 to 40 inches over sandy material over loamy glacial till at a depth of more than 60 inches
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Thurman—rapid; Flandreau—moderate in the loamy sediments, rapid in the underlying sandy material, and moderately slow in the underlying loamy glacial till
Available water capacity: Thurman—low; Flandreau—moderate
Content of organic matter: Thurman—moderately low; Flandreau—moderate

Surface runoff class: Thurman—low; Flandreau—medium

Inclusions

Contrasting inclusions:
• The well drained Blendon and Davis soils, which are dark to a depth of more than 20 inches; on footslopes
• The well drained Dobalt soils, which have glacial till at a depth of 20 to 40 inches; on summits and backslopes
• The well drained Henkin soils, which have more clay than the Thurman soil and average less clay in the subsoil than the Flandreau soil; on backslopes

Similar inclusions:
• Soils that have less sandy material than the Flandreau soil
• Soils that have more gravelly material than the Thurman soil

Use and Management

Cropland and pasture

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Poorly suited
Management concerns: Thurman—wind erosion, the restricted available water capacity, and agrochemical leaching and runoff; Flandreau—water erosion, the restricted available water capacity, and agrochemical leaching
Management considerations:
• These soils are better suited to early maturing crops, such as small grain, than to some other crops. Minimizing tillage, farming on the contour, and leaving crop residue on the surface help to control erosion and conserve moisture.
• Including grasses and legumes in the rotation helps to control erosion and helps to maintain tilth and the content of organic matter.
• Irrigation helps to overcome the limited ability of the soils to store water if an adequate and dependable supply of water is available.
• Applying nitrogen close to the time when crops will use it reduces the amount of time available for leaching.
• Seeding cultivated areas to adapted grasses helps to control erosion.

Interpretive Groups

Land capability classification: Thurman—4e; Flandreau—3e
Range site: Thurman—Sandy; Flandreau—Silty
Windbreak suitability group: Thurman—5; Flandreau—3
Pasture suitability group: Thurman—H; Flandreau—F

TgD—Thurman-Grovena complex, 9 to 15 percent slopes

Composition

Thurman and similar soils: 25 to 55 percent
Grovena and similar soils: 20 to 40 percent
Contrasting inclusions: 15 to 35 percent

Setting

Landform: Moraines
Position on the landform: Thurman—shoulders and backslopes; Grovena—backslopes
Slope range: 9 to 15 percent
Shape of areas: Oval or elongated
Size of areas: 10 to 50 acres

Typical Profile

Thurman

Surface layer:
0 to 6 inches—grayish brown fine sandy loam

Subsurface layer:
6 to 10 inches—grayish brown fine sandy loam

Transitional layer:
10 to 18 inches—dark yellowish brown fine sandy loam

Underlying layer:
18 to 70 inches—pale brown and light yellowish brown loamy fine sand and fine sand
70 to 80 inches—light yellowish brown, calcareous fine sand that has relict redoximorphic features

Grovena

Surface layer:
0 to 9 inches—dark grayish brown loam

Subsoil:
9 to 13 inches—brown silt loam
13 to 24 inches—yellowish brown silt loam
24 to 30 inches—light yellowish brown loam
30 to 36 inches—light yellowish brown, calcareous loam

Underlying layer:
36 to 51 inches—light yellowish brown, calcareous sandy loam
51 to 80 inches—calcareous clay loam that is light yellowish brown in the upper part and very pale brown in the lower part; redoximorphic concentrations in the lower part

Soil Properties and Qualities

Drainage class: Thurman—somewhat excessively drained; Grovena—well drained

Depth to bedrock: Very deep
Depth to contrasting parent material: Thurman—more than 60 inches; Grovena—more than 40 inches over loamy glacial till or sandy material
Depth to high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Thurman—rapid; Grovena—moderate
Available water capacity: Thurman—low; Grovena—high
Content of organic matter: Thurman—moderately low; Grovena—moderate
Surface runoff class: Thurman—low; Grovena—high

Inclusions

Contrasting inclusions:
- The well drained Blendon soils, which are dark to a depth of more than 20 inches and contain more sand than the major soils; on footslopes
- The well drained, silty Davis soils, which are dark to a depth of more than 20 inches; on footslopes
- The moderately well drained Bonilla soils on footslopes
- The well drained Crofton soils, which have more silt and less sand than the Grovena soil; on summits and shoulders

Similar inclusions:
- Soils that are calcareous within a depth of 30 inches
- Soils that grade to sandy material within a depth of 40 inches

Use and Management

Cropland and pasture

Suitability for crops: Generally unsuited
Management concerns: Thurman—wind erosion, the restricted available water capacity, and agrochemical leaching and runoff; Grovena—water erosion and the restricted available water capacity
Management considerations:
- Proper grazing management helps to maintain plant vigor and control erosion.
- Applying nitrogen close to the time when crops will use it reduces the amount of time available for leaching.
- Seeding cultivated areas to adapted grasses helps to control erosion.

Interpretive Groups

Land capability classification: Thurman—6e; Grovena—4e
Range site: Thurman—Sandy; Grovena—Silty
Windbreak suitability group: Thurman—5; Grovena—3
Pasture suitability group: Thurman—H; Grovena—F

Tr—Trent silty clay loam, 0 to 2 percent slopes

Composition

Trent and similar soils: 75 to 90 percent
Contrasting inclusions: 10 to 25 percent

Setting

Landform: Plains
Position on the landform: Footslopes
Slope range: 0 to 2 percent
Shape of areas: Elongated
Size of areas: 5 to 100 acres

Typical Profile

Surface soil:
0 to 15 inches—dark gray silty clay loam

Subsoil:
15 to 23 inches—dark grayish brown silty clay loam
23 to 28 inches—pale brown silty clay loam
28 to 46 inches—brown silty clay loam and silt loam; redoximorphic concentrations in the upper part and redoximorphic concentrations and depletions in the lower part
46 to 52 inches—light brownish gray, calcareous silt loam that has redoximorphic concentrations and depletions

Underlying layer:
52 to 80 inches—light brownish gray, calcareous silt loam that has redoximorphic concentrations and depletions

Soil Properties and Qualities

Drainage class: Moderately well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 40 inches over loamy glacial till
Depth to high water table: 3.5 to 5.0 feet
Flooding: None
Ponding: None
Permeability: Moderate
Available water capacity: High
Content of organic matter: High
Surface runoff class: Low
Other properties: Runoff water flows over the Trent soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Chancellor soils on toeslopes

- The well drained Moody soils on backslopes
- The moderately well drained Wakonda soils, which are calcareous within a depth of 6 inches; on footslopes
- The somewhat poorly drained Whitewood soils on toeslopes

Similar inclusions:
- Soils that have an irregular decrease in organic matter content with increasing depth

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Few limitations
Management considerations:
- Managing crop residue conserves moisture and helps to maintain the content of organic matter, fertility, and tilth.

Interpretive Groups

Land capability classification: 1
Range site: Loamy Overflow
Windbreak suitability group: 1
Pasture suitability group: K

W—Water

- This map unit consists of open areas of water, including lakes, ponds, and streams.

Wa—Wakonda-Chancellor silty clay loams, 0 to 2 percent slopes

Composition

Wakonda and similar soils: 35 to 60 percent
Chancellor and similar soils: 25 to 45 percent
Contrasting inclusions: 10 to 25 percent

Setting

Landform: Till plains and plains
Position on the landform: Wakonda—footslopes; Chancellor—toeslopes
Slope range: Wakonda—0 to 2 percent; Chancellor—0 to 1 percent
Shape of areas: Irregular or elongated
Size of areas: 10 to 80 acres

Typical Profile

Wakonda

Surface soil:
0 to 13 inches—dark gray, calcareous silty clay loam

Subsoil:
13 to 19 inches—grayish brown, calcareous silty clay loam
19 to 28 inches—light olive brown, calcareous silty clay loam
28 to 38 inches—light olive brown, calcareous silty clay loam that has redoximorphic concentrations

Underlying layer:
38 to 73 inches—light olive brown and light yellowish brown, calcareous silty clay loam and silt loam; redoximorphic concentrations and depletions
73 to 80 inches—light yellowish brown, calcareous loam that has redoximorphic concentrations and depletions

Chancellor

Surface soil:
0 to 12 inches—very dark gray silty clay loam

Subsoil:
12 to 17 inches—very dark gray silty clay
17 to 23 inches—dark gray silty clay
23 to 31 inches—dark gray silty clay that has redoximorphic concentrations
31 to 47 inches—gray, calcareous silty clay loam that has redoximorphic concentrations

Underlying layer:
47 to 80 inches—light brownish gray, calcareous silty clay loam that has redoximorphic concentrations

Soil Properties and Qualities

Drainage class: Wakonda—moderately well drained; Chancellor—somewhat poorly drained
Depth to bedrock: Very deep
Depth to contrasting parent material: Wakonda—more than 40 inches over loamy glacial till; Chancellor—more than 60 inches
High water table: Wakonda—at a depth of 2 to 4 feet; Chancellor—at the surface to 2 feet below the surface
Flooding: Wakonda—none; Chancellor—frequent for brief periods

Ponding: None
Permeability: Wakonda—moderate; Chancellor—slow
Available water capacity: High
Content of organic matter: Wakonda—moderate; Chancellor—high
Surface runoff class: Wakonda—low; Chancellor—very low
Other properties: The Wakonda soil has a high content of lime. Runoff water flows over the Wakonda and Chancellor soils during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
- The very poorly drained Baltic soils in basins
- The somewhat poorly drained Lamo soils, which are calcareous within a depth of 10 inches; on low flood plains
- The well drained Moody and Wentworth soils on summits and backslopes
- The moderately well drained Trent soils, which are not calcareous within a depth of 30 inches; on footslopes

Similar inclusions:
- Soils that have more sand in the subsoil than the Chancellor soil
- Soils that have more sand and less silt than the Wakonda soil

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Wakonda—wind erosion and the high content of lime, which adversely affects the availability of plant nutrients; Chancellor—flooding, high water table, and a slow rate of water infiltration
Management considerations:
- In wet years these soils are better suited to late-planted crops than to some other crops.
- Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion.
- Including grasses and legumes in the rotation helps to control erosion and helps to maintain the content of organic matter, fertility, and tilth.
- Practices that reduce runoff from adjacent soils help to control wetness.
- Deferring tillage on the Chancellor soil during wet periods helps to prevent soil compaction.

Interpretive Groups

Land capability classification: Wakonda—2s; Chancellor—2w
Range site: Wakonda—Limy Subirrigated; Chancellor—Loamy Overflow
Windbreak suitability group: Wakonda—1K; Chancellor—2
Pasture suitability group: Wakonda—F; Chancellor—A

WcA—Wentworth-Chancellor-Wakonda silty clay loams, 0 to 2 percent slopes

Composition

Wentworth and similar soils: 40 to 60 percent
Chancellor and similar soils: 15 to 35 percent
Wakonda and similar soils: 10 to 30 percent
Contrasting inclusions: 5 to 25 percent

Setting

Landform: Till plains
Position on the landform: Wentworth—summits and backslopes; Chancellor—toeslopes; Wakonda—footslopes
Slope range: Wentworth—0 to 2 percent; Chancellor—0 to 1 percent; Wakonda—0 to 2 percent
Shape of areas: Irregular
Size of areas: 20 to 100 acres

Typical Profile

Wentworth

Surface layer:
0 to 10 inches—dark gray silty clay loam

Subsoil:
10 to 26 inches—brown silty clay loam
26 to 43 inches—light yellowish brown, calcareous silty clay loam
43 to 55 inches—light yellowish brown, calcareous silty clay loam that has redoximorphic depletions

Underlying layer:
55 to 80 inches—light brownish gray, calcareous silt loam and stratified fine sandy loam; redoximorphic concentrations and depletions

Chancellor

Surface soil:
0 to 12 inches—very dark gray silty clay loam

Subsoil:
12 to 17 inches—very dark gray silty clay
17 to 23 inches—dark gray silty clay

23 to 31 inches—dark gray silty clay that has redoximorphic concentrations
31 to 47 inches—gray, calcareous silty clay loam that has redoximorphic concentrations

Underlying layer:
47 to 80 inches—light brownish gray, calcareous silty clay loam that has redoximorphic concentrations

Wakonda

Surface soil:
0 to 13 inches—dark gray, calcareous silty clay loam

Subsoil:
13 to 19 inches—grayish brown, calcareous silty clay loam
19 to 28 inches—light olive brown, calcareous silty clay loam
28 to 38 inches—light olive brown, calcareous silty clay loam that has redoximorphic concentrations

Underlying layer:
38 to 73 inches—light olive brown and light yellowish brown, calcareous silty clay loam and silt loam; redoximorphic concentrations and depletions
73 to 80 inches—light yellowish brown, calcareous loam that has redoximorphic concentrations and depletions

Soil Properties and Qualities

Drainage class: Wentworth—moderately well drained; Chancellor—somewhat poorly drained; Wakonda—moderately well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: Wentworth—more than 40 inches over loamy glacial till; Chancellor—more than 60 inches; Wakonda—more than 40 inches over loamy glacial till
High water table: Wentworth—at a depth of 3 to 5 feet; Chancellor—at the surface to 2 feet below the surface; Wakonda—at a depth of 2 to 4 feet
Flooding: Wentworth—none; Chancellor—frequent for brief periods; Wakonda—none
Ponding: None
Permeability: Wentworth—moderate; Chancellor—slow; Wakonda—moderate
Available water capacity: High
Content of organic matter: Wentworth—moderate; Chancellor—high; Wakonda—moderate
Surface runoff class: Low
Other properties: Runoff water flows over the Chancellor soil during periods of rainfall or snowmelt. The Wakonda soil has a high content of lime.

Inclusions

Contrasting inclusions:
- The well drained Clarno soils, which have more sand and less silt than the Wentworth soil; on summits and backslopes
- The well drained Huntimer soils, which have more clay than the Wentworth soil; on summits and backslopes
- Splitrock soils, which have glacial till at a depth of 20 to 40 inches; on summits and backslopes
- The moderately well drained Trent soils, which are not calcareous within a depth of 30 inches; on footslopes
- The poorly drained Tetonka soils in shallow basins

Similar inclusions:
- Soils that have more sand in the subsoil than the Chancellor soil
- Soils that have more sand and less silt than the Wakonda soil
- Soils that have less clay in the subsoil than the Chancellor soil

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Wentworth—few limitations; Chancellor—flooding, high water table, and a slow rate of water infiltration; Wakonda—wind erosion and the high content of lime, which adversely affects the availability of plant nutrients
Management considerations:
- In wet years the Chancellor and Wakonda soils are better suited to late-planted crops than to some other crops.
- Managing crop residue helps to control erosion, conserves moisture, and helps to maintain tilth and the content of organic matter.
- Including grasses and legumes in the rotation helps to control erosion and helps to maintain the content of organic matter, fertility, and tilth.
- Practices that reduce runoff from adjacent soils help to control wetness.
- Deferring tillage on the Chancellor soil during wet periods helps to prevent soil compaction.

Interpretive Groups

Land capability classification: Wentworth—1; Chancellor—2w; Wakonda—2s
Range site: Wentworth—Silty; Chancellor—Loamy Overflow; Wakonda—Limy Subirrigated
Windbreak suitability group: Wentworth—3; Chancellor—2; Wakonda—1K
Pasture suitability group: Wentworth—F; Chancellor—A; Wakonda—F

WhA—Wentworth-Trent silty clay loams, 0 to 2 percent slopes

Composition

Wentworth and similar soils: 45 to 75 percent
Trent and similar soils: 20 to 40 percent
Contrasting inclusions: 5 to 25 percent

Setting

Landform: Till plains
Position on the landform: Wentworth—summits and backslopes; Trent—footslopes
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 20 to 200 acres

Typical Profile

Wentworth

Surface layer:
0 to 10 inches—dark gray silty clay loam

Subsoil:
10 to 30 inches—pale brown silty clay loam
30 to 50 inches—pale brown, calcareous silty clay loam

Underlying layer:
50 to 80 inches—pale yellow, calcareous silty clay loam that has redoximorphic concentrations and depletions

Trent

Surface soil:
0 to 15 inches—dark gray silty clay loam

Subsoil:
15 to 23 inches—dark grayish brown silty clay loam
23 to 28 inches—pale brown silty clay loam
28 to 46 inches—brown silty clay loam and silt loam; redoximorphic concentrations in the upper part and redoximorphic concentrations and depletions in the lower part
46 to 52 inches—light brownish gray, calcareous silt loam that has redoximorphic concentrations and depletions

Underlying layer:
52 to 80 inches—light brownish gray, calcareous silt loam that has redoximorphic concentrations and depletions

Soil Properties and Qualities

Drainage class: Wentworth—well drained; Trent—moderately well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: Wentworth—more than 60 inches over loamy glacial till; Trent—more than 40 inches over loamy glacial till
Depth to high water table: Wentworth—more than 6 feet; Trent—3.5 to 5.0 feet
Flooding: None
Ponding: None
Permeability: Moderate
Available water capacity: High
Content of organic matter: Wentworth—moderate; Trent—high
Surface runoff class: Low
Other properties: Runoff water flows over the Trent soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Chancellor soils on toeslopes
• The poorly drained Tetonka soils in basins
• The well drained Clarno soils, which have more sand and less silt than the major soils; on summits and backslopes
• The well drained Huntimer soils, which have more clay than the major soils; on summits and backslopes
• The moderately well drained Wakonda soils, which are calcareous within a depth of 6 inches; on footslopes

Similar inclusions:
• Soils that have glacial till at a depth of 20 to 40 inches

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Few limitations
Management considerations:
• Managing crop residue conserves moisture and helps to maintain tilth and the content of organic matter.

Interpretive Groups

Land capability classification: Wentworth—1; Trent—1
Range site: Wentworth—Silty; Trent—Loamy Overflow
Windbreak suitability group: Wentworth—3; Trent—1
Pasture suitability group: Wentworth—F; Trent—K

WhB—Wentworth-Trent silty clay loams, 1 to 6 percent slopes

Composition

Wentworth and similar soils: 45 to 70 percent
Trent and similar soils: 15 to 35 percent
Contrasting inclusions: 5 to 25 percent

Setting

Landform: Till plains
Position on the landform: Wentworth—summits and backslopes; Trent—footslopes
Slope range: Wentworth—2 to 6 percent; Trent—1 to 2 percent
Shape of areas: Irregular
Size of areas: 10 to 100 acres

Typical Profile

Wentworth

Surface layer:
0 to 10 inches—dark gray silty clay loam

Subsoil:
10 to 30 inches—pale brown silty clay loam
30 to 50 inches—pale brown, calcareous silty clay loam

Underlying layer:
50 to 80 inches—pale yellow, calcareous silty clay loam that has redoximorphic concentrations and depletions

Trent

Surface soil:
0 to 15 inches—dark gray silty clay loam

Subsoil:
15 to 23 inches—dark grayish brown silty clay loam
23 to 28 inches—pale brown silty clay loam
28 to 46 inches—brown silty clay loam and silt loam; redoximorphic concentrations in the upper part and redoximorphic concentrations and depletions in the lower part
46 to 52 inches—light brownish gray, calcareous silt loam that has redoximorphic concentrations and depletions

Underlying layer:
52 to 80 inches—light brownish gray, calcareous silt loam that has redoximorphic concentrations and depletions

Soil Properties and Qualities

Drainage class: Wentworth—well drained; Trent—moderately well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: Wentworth—more than 60 inches over loamy glacial till; Trent—more than 40 inches over loamy glacial till
Depth to high water table: Wentworth—more than 6 feet; Trent—3.5 to 5.0 feet
Flooding: None
Ponding: None
Permeability: Moderate
Available water capacity: High
Content of organic matter: Wentworth—moderate; Trent—high
Surface runoff class: Wentworth—medium; Trent—low

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Chancellor soils on toeslopes
- The poorly drained Tetonka soils in basins
- The well drained Clarno soils, which have more sand and less silt than the major soils; on summits and backslopes
- The moderately well drained Wakonda soils, which are calcareous within a depth of 6 inches; on footslopes
- The somewhat poorly drained Whitewood soils on toeslopes

Similar inclusions:
- Soils that have glacial till at a depth of 20 to 40 inches
- Soils that are dark to a depth of less than 8 inches

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Wentworth—water erosion; Trent—few limitations
Management considerations:
- Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture.
- Contour farming and grassed waterways help to control water erosion, but slopes in some areas are too irregular for contour farming.

• Including grasses and legumes in the rotation helps to control erosion and helps to maintain tilth and the content of organic matter.

Interpretive Groups

Land capability classification: Wentworth—2e; Trent—1
Range site: Wentworth—Silty; Trent—Loamy Overflow
Windbreak suitability group: Wentworth—3; Trent—1
Pasture suitability group: Wentworth—F; Trent—K

Wk—Whitewood silty clay loam, 0 to 2 percent slopes

Composition

Whitewood and similar soils: 75 to 90 percent
Contrasting inclusions: 10 to 25 percent

Setting

Landform: Till plains and plains
Position on the landform: Toeslopes
Slope range: 0 to 2 percent
Shape of areas: Elongated
Size of areas: 10 to 50 acres

Typical Profile

Surface layer:
0 to 10 inches—dark gray silty clay loam that has redoximorphic concentrations

Subsurface layer:
10 to 16 inches—dark gray silty clay loam

Subsoil:
16 to 36 inches—dark gray silty clay loam that has redoximorphic concentrations
36 to 50 inches—grayish brown silty clay loam that has redoximorphic concentrations and depletions
50 to 62 inches—grayish brown, calcareous silty clay loam that has redoximorphic concentrations and depletions

Underlying layer:
62 to 80 inches—light olive gray, calcareous silty clay loam that has redoximorphic concentrations

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 60 inches
High water table: At the surface to 2 feet below the surface
Flooding: Frequent for very brief periods
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Content of organic matter: High
Surface runoff class: Low
Other properties: Runoff water flows over the Whitewood soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Lamo soils, which are calcareous within a depth of 10 inches; on low flood plains
• The poorly drained Tetonka soils in shallow basins
• The moderately well drained Trent and Wakonda soils on footslopes

Similar inclusions:
• Soils that contain more clay in the subsoil than the Whitewood soil
• Soils that contain more sand and less silt than the Whitewood soil

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Suitability for crops: Well suited
Management concerns: Flooding, high water table
Management considerations:
• In wet years this soil is better suited to late-planted crops than to some other crops.
• Deferring tillage when the soil is wet helps to prevent soil compaction.
• Practices that reduce runoff from adjacent soils help to control wetness.
• Maintaining existing drainage systems helps to remove excess water.

Interpretive Groups

Land capability classification: 2w
Range site: Loamy Overflow
Windbreak suitability group: 2
Pasture suitability group: A

Wo—Worthing silty clay loam, 0 to 1 percent slopes

Composition

Worthing and similar soils: 85 to 99 percent
Contrasting inclusions: 1 to 15 percent

Setting

Landform: Till plains
Position on the landform: Basins
Slope range: 0 to 1 percent
Shape of areas: Oval
Size of areas: 5 to 100 acres

Typical Profile

Surface soil:
0 to 16 inches—dark gray silty clay loam

Subsoil:
16 to 25 inches—dark gray silty clay
25 to 46 inches—dark gray silty clay that has redoximorphic concentrations
46 to 58 inches—gray silty clay loam that has redoximorphic concentrations

Underlying layer:
58 to 80 inches—light olive gray silty clay loam that has redoximorphic concentrations and depletions

Soil Properties and Qualities

Drainage class: Very poorly drained
Depth to bedrock: Very deep
Depth to contrasting parent material: More than 40 inches over loamy glacial till
Depth to high water table: 2 feet above to 1 foot below the surface
Flooding: None
Ponding: Frequent for very long periods
Permeability: Slow
Available water capacity: High
Content of organic matter: High
Surface runoff class: Negligible

Inclusions

Contrasting inclusions:
• The very poorly drained Baltic soils, which are calcareous throughout; in basins
• The poorly drained Tetonka soils in shallow basins
• The moderately well drained Wakonda and Davison soils on footslopes

Similar inclusions:
• Soils that contain less clay than the Worthing soil

Use and Management

Pasture and cropland

Main crops: Drained areas—alfalfa, corn, and soybeans; undrained areas—none
Suitability for crops: Generally unsuited
Management concerns: Ponding, high water table, and soil compaction
Management considerations:
• Proper grazing management helps to maintain plant vigor.
• Deferring tillage when the soil is wet helps to prevent soil compaction.
• Restricting grazing during wet periods helps to prevent soil compaction.
• Maintaining existing drainage systems helps to remove excess water.
• Areas of this map unit should be maintained as wildlife habitat.

Interpretive Groups

Land capability classification: 5w
Range site: Shallow Marsh
Windbreak suitability group: 10
Pasture suitability group: B2

Wr—Worthing-Davison complex, 0 to 2 percent slopes

Composition

Worthing and similar soils: 30 to 55 percent
Davison and similar soils: 25 to 50 percent
Contrasting inclusions: 10 to 25 percent

Setting

Landform: Till plains
Position on the landform: Worthing—basins; Davison—footslopes
Slope range: Worthing—0 to 1 percent; Davison—0 to 2 percent
Shape of areas: Elongated
Size of areas: 10 to 100 acres

Typical Profile

Worthing

Surface soil:
0 to 16 inches—dark gray silty clay loam

Subsoil:
16 to 25 inches—dark gray silty clay
25 to 46 inches—dark gray silty clay that has redoximorphic concentrations
46 to 58 inches—gray silty clay loam that has redoximorphic concentrations

Underlying layer:
58 to 80 inches—light olive gray silty clay loam that has redoximorphic concentrations and depletions

Davison

Surface layer:
0 to 8 inches—dark gray, calcareous clay loam

Subsoil:
8 to 22 inches—light yellowish brown, calcareous clay loam that has redoximorphic concentrations
22 to 41 inches—light yellowish brown, calcareous clay loam that has redoximorphic concentrations and depletions

Underlying layer:
41 to 54 inches—light olive brown, calcareous clay loam that has redoximorphic concentrations and depletions
54 to 80 inches—light yellowish brown and pale yellow, calcareous clay loam that has redoximorphic concentrations and depletions

Soil Properties and Qualities

Drainage class: Worthing—very poorly drained; Davison—moderately well drained
Depth to bedrock: Very deep
Depth to contrasting parent material: Worthing—more than 40 inches over loamy glacial till; Davison—more than 60 inches
High water table: Worthing—2 feet above to 1 foot below the surface; Davison—at a depth of 1.5 to 4.0 feet
Flooding: None
Ponding: Worthing—frequent for very long periods; Davison—none
Permeability: Worthing—slow; Davison—moderate
Available water capacity: High
Content of organic matter: Worthing—high; Davison—moderate
Surface runoff class: Worthing—negligible; Davison—low
Other properties: The Davison soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The moderately well drained Bonilla and Trent soils, which are dark to a depth of 20 inches or more; on footslopes
• The well drained Egan soils on backslopes
• The poorly drained Tetonka soils in shallow basins
• The somewhat poorly drained Whitewood, Chancellor, and Crossplain soils on toeslopes

Similar inclusions:
• Soils that have less sand and more silt than the Davison soil

Use and Management

Cropland (where drained) and pasture

Suitability for crops: Generally unsuited
Management concerns: Worthing—ponding, high water table, and soil compaction; Davison—wind erosion and the high content of lime, which adversely affects the availability of plant nutrients
Management considerations:
• Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion.
• Including grasses and legumes in the rotation helps to control erosion and helps to maintain the content of organic matter, fertility, and tilth.
• Maintaining existing drainage systems helps to remove excess water in areas of the Worthing soil. Deferring tillage when the soil is wet helps to prevent soil compaction. Restricting grazing during wet periods helps to prevent surface compaction.

Interpretive Groups

Land capability classification: Worthing—5w; Davison—2s
Range site: Worthing—Shallow Marsh; Davison—Limy Subirrigated
Windbreak suitability group: Worthing—10; Davison—1K
Pasture suitability group: Worthing—B2; Davison—F

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help to prevent soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland and woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreational facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

The soils in the survey area are assigned to various interpretive groups at the end of each map unit description and in some of the tables. The groups for each map unit are also shown in the section “Interpretive Groups,” which follows the tables at the back of the survey.

Crops and Pasture

General management needed for crops and for pasture and hayland is suggested in this section. The crops best suited to the soils, including some not commonly grown in the survey area, are identified; soil productivity ratings and the estimated yields of the main crops and hay and pasture plants are listed for each soil; the system of land capability classification used by the Natural Resources Conservation Service is explained; and prime farmland is described.

Planners developing management systems for individual fields or farms should consider the detailed information given in the description of each soil under the heading “Detailed Soil Map Units.” Specific information can be obtained from the local office of the Natural Resources Conservation Service, the South Dakota Cooperative Extension Service, and the Agricultural Experiment Station at South Dakota State University.

Crops

Jeffrey A. Hemenway, conservation agronomist, Natural Resources Conservation Service, helped prepare this section.

About 75 percent of the acreage in Minnehaha County is used for cultivated crops or tame pasture (U.S. Department of Commerce, 1999). The major crops are corn and soybeans. Alfalfa, barley, millet, oats, and spring wheat also are grown. Alfalfa is harvested mainly for hay; spring wheat and soybeans are grown as cash crops. Corn, oats, and barley are grown as cash crops and as livestock feed. Corn is harvested for both silage and grain.

The potential of the soils in Minnehaha County for increased crop production is good. Crop production could be increased considerably by extending the latest crop production technology to all cropland in the county. This soil survey can greatly facilitate the application of such technology.

The soil resource is agriculture’s foundation. Protecting the soil resource requires an understanding of soil quality. *Soil quality* is the fitness of a specific

kind of soil to function within its surroundings, support plant and animal productivity, maintain or enhance the quality of water and air, and support human health and habitation.

Soil quality has a direct effect on plant growth and productivity for crops, range, hay, and woodland. It affects how water moves into and through the soil. Maintaining or enhancing soil quality can reduce the negative effects of erosion. Improving soil quality can reduce the movement of nitrates and other chemicals to adjacent water bodies and into the ground water. Maintaining a high level of soil quality will ensure that the soil resource is sustained for the future.

Soil quality and soil health can be evaluated by monitoring several indicators. For example, an indicator of soil loss by erosion may be the thinning of the surface layer or visual and physical evidence of gullies, small rills, and adjacent sediment. Indicators for physical, chemical, and biological conditions can be simple field tests or sophisticated laboratory analyses.

As a result of past agricultural practices, the inherent quality of many soils has been degraded. Good management practices, however, such as conservation tillage, nutrient and moisture management systems, and riparian buffers or windbreaks, can improve soil quality. As a rule, management practices that maintain a cover of vegetation on the soil, return the maximum practical amount of residue to the surface, and minimize soil disturbance (tillage) result in higher levels of soil quality.

Degradation of soil quality can have negative effects on the soil resource and can result in costly offsite impacts. Soil erosion and the consequential deposition of sediment by wind or water are examples. Other negative effects of soil degradation include the compaction and loss of granular structure in the surface layer, a reduced rate of water infiltration, a reduced content of organic matter, and the formation of surface crusts. Degradation of soils can also lead to nutrient loss or imbalances, pesticide carryover, and reduced biological activity.

Soil quality indicators may be considered diagnostic tools for assessing the health of the soil. They may also engender a cause for concern for the land user and thus may stimulate a change in management. Monitoring trends in soil health can help in planning and evaluating current land use practices.

The paragraphs that follow describe the management needed on the cropland in the county.

Water erosion is a major problem on more than half of the land in Minnehaha County used for crops or for hay and pasture. Water erosion reduces productivity and results in sedimentation. It is a hazard in areas of Betts, Crofton, Ethan, Shindler, Steinauer, Talmo, and other soils that have slopes of more than 2 percent. Productivity is reduced when the more fertile surface layer is lost and part of the subsoil is incorporated into the plow layer. Loss of the surface layer is especially damaging on soils that have a thin surface layer, such as Betts and Steinauer soils. Erosion also reduces the productivity of soils that tend to be droughty, such as Delmont and Talmo soils.

Water erosion can accelerate the pollution of surface water sources by increasing runoff, whereby sediments rich in nutrients and possible pesticides enter streams, lakes, and potholes. Phosphorus loading of surface waters by surface runoff and sediments is a major concern in South Dakota. Measures that control water erosion minimize the pollution of streams and lakes by sediment and preserve the quality of water for fish and wildlife and for recreational and municipal uses. Such measures also reduce the amount of fertilizer needed in cropped areas by helping to prevent the removal of plant nutrients and the movement of agrochemicals.

Pesticide and nutrient runoff can be managed by using a system of conservation tillage that leaves crop residue on the surface, by following pesticide labels, and by applying fertilizer based on the results of soil nutrient testing. Limiting row crops in areas that have slopes of more than 8 percent reduces the rate of runoff of pesticides and nutrients. Runoff from upland areas can concentrate pesticides on ponded soils.

Pesticide and nutrient runoff is a concern if the soil is occasionally flooded or frequently flooded; is subject to ponding; is assigned to hydrologic group C or D and has a slope of more than 2 percent; is assigned to hydrologic group A and has a slope of more than 6 percent; or is assigned to hydrologic group B, has a slope of 3 percent or more, and has a K factor of more than 0.17.

A cropping sequence that keeps a plant cover on the surface for extended periods holds soil losses to an amount that will not reduce the productive capacity of the soils. If a plant cover cannot protect the soil, careful management of crop residue is essential. Minimizing tillage and leaving crop residue on the surface increase the rate of water infiltration, reduce the runoff rate, and help to control erosion.

Terraces and diversions reduce the length of slopes and thus reduce the runoff rate and help to control erosion on the gently sloping Moody, Nora, and Splitrock soils (fig. 12). Many areas of Delmont, Egan, and Ethan soils are poorly suited to terraces and

Figure 12.—Terraces help to control water erosion in this area of Nora-Crofton complex, 6 to 9 percent slopes.

diversions because of short, irregular slopes or because of an unfavorable subsoil that would be exposed in terrace channels.

Wind erosion is a slight or moderate hazard in many areas of the county. The hazard of wind erosion is greatest on the sandy Thurman soils and the clayey Clamo and Corson soils. Soils that have a high content of lime in the surface layer, such as Arlo, Betts, and Wakonda soils, also are highly susceptible to wind erosion. These soils can be damaged in a few hours if the winds are strong and the soils are dry and are not protected by a plant cover or surface mulch. Intensively cultivated areas of soils that formed in loess, such as Moody, Nora, and Crofton soils, also are susceptible to wind erosion. Wind erosion can be controlled by maintaining the content of organic matter, maintaining an adequate plant cover or a cover of crop residue, stripcropping, and keeping the surface rough. Planting windbreaks of suitable trees and shrubs also is effective in controlling wind erosion.

A soil crust is a relatively thin, somewhat continuous layer on the soil surface that can restrict the movement of water and air into the soil and can hinder seedling emergence. Such crusts generally are less than 2 inches thick. Surface crusting increases the hazard of wind erosion in many areas. They reduce the rate of water infiltration and increase the runoff rate. Maintaining a cover of vegetation or crop residue on the soil helps to minimize the impact of raindrops. Management practices that improve the stability of soil aggregates, increase the content of organic matter, and minimize the concentration of sodium ions can help to prevent surface crusting. A rotary hoe or row cultivator can be used to shatter the crust and thus improve seedling emergence and weed control.

Information about measures that control erosion on each kind of soil is included in the Field Office Technical Guide, which is available in the local office of the Natural Resources Conservation Service.

Wetness is a major management concern in areas of the somewhat poorly drained Chancellor,

Crossplain, Lamo, and Whitewood soils, the poorly drained Clamo, Salmo, and Tetonka soils, and the very poorly drained Baltic, Obert, and Worthing soils. Unless they are artificially drained, these soils are so wet that crops frequently are damaged. These soils also have a potential for denitrification. Open ditch drainage systems can remove excess water if a drainage outlet is available. Controlling the runoff from adjacent soils also helps to minimize wetness and agrochemical movement in these soils.

The moderately well drained Alcester, Bon, Bonilla, Davis, and Trent soils are on high flood plains and footslopes that receive additional moisture when streams occasionally overflow and when water runs off the higher adjacent soils. Tillage and planting are delayed in the spring during wet years; in most years, however, natural drainage is adequate and the additional moisture is beneficial for crops. Denitrification can occur when runoff water flows over these soils and tillage and planting are delayed.

Soil fertility helps to determine the yields that can be obtained from the soil. Fertility can be improved by applying fertilizer and animal wastes and by including grasses and legumes in the cropping system. In areas of soils that have a high content of lime in the surface layer, such as Betts, Crofton, Davison, Ethan, and Wakonda soils, the kinds and amounts of fertilizer applied should be based on the results of soil tests, on the needs of the crop, and on the expected level of yields. The South Dakota Cooperative Extension Service or the South Dakota Agricultural Experiment Station at South Dakota State University can help in determining the kinds and amounts of fertilizer needed, the appropriate application methods, and the correct timing of application. The appropriate methods may vary, depending on the crop, the soil, climatic conditions, and the location of the field in relation to the depth to an aquifer and the distance to surface water sources. In steep areas and in areas of soils that are susceptible to leaching, careful monitoring of the use of agrochemicals can help to prevent environmental problems. The leaching of nitrates and pesticides is most commonly associated with soils that are underlain by sand or gravel, soils that are subject to occasional or frequent flooding, soils that are susceptible to run-on during periods of heavy rainfall or snowmelt, and soils that have steep slopes and a high potential for water erosion. Using a nutrient and pesticide management plan can help to control the leaching potential. Such a plan involves following pesticide labeling and fertility recommendations based on soil nutrient tests. The key to preventing large nitrogen losses to ground water is minimizing the additions of nutrients that are not used by the present crops. Applying nitrogen close to the time when the crops will use it also can reduce the risk of losses by shortening the time available for leaching (Gerwing and Gelderman, 1993).

Soil tilth is an important factor in the germination of seeds and the infiltration of water into the soil. Soils that have good tilth are granular and porous. If tilled when wet, Benclare and Corson soils tend to be very cloddy when they dry. As a result of the cloddiness, preparing a good seedbed is difficult. These soils dry out slowly in the spring and can be difficult to till during wet periods. Maintaining tilth is also a concern in areas of the somewhat poorly drained Chancellor, Crossplain, and Lamo soils, the poorly drained Clamo soils, and the very poorly drained Baltic and Worthing soils. These soils commonly are wet in the spring, and they dry out slowly. Tillage is difficult in areas of these soils, and tilth deteriorates if they are cultivated at a high moisture content. Tilth is poor in soils that have a claypan, such as Gayville soils. Tilling in a timely manner, including grasses and legumes in the cropping system, and incorporating crop residue into the soil improve tilth and increase the rate of water infiltration.

Soil compaction also is an important factor in soil management. It can occur when important physical properties, such as pore space, are degraded. Soil compaction results from weight on the soil pushing the soil particles together. When compaction occurs in the surface layer or subsoil, aeration is impaired and plant roots have more difficulty pushing through the soil to reach water and nutrients. Other soil conditions that affect compaction are wet conditions and clayey textures in the surface layer and subsoil. Compaction is a concern if the upper 10 inches of the soil has more than 35 percent clay.

Management measures that improve soil tilth and minimize surface compaction include using high-residue crops in the rotation a high percentage of the time, preventing trampling by livestock during wet periods, deferring the use of equipment during wet periods, leaving as much residue as possible on or near the surface, and eliminating unnecessary tillage trips. The timing of farming activities is critical. If compaction has occurred, it can be reduced through ripping or deep plowing. Tilth and compaction are especially important in areas of clayey soils, such as Badger, Chancellor, Clamo, Crossplain, Lamo, and Whitewood soils and in claypan, or sodium-affected, soils, such as Gayville soils.

Sodium-affected soils create some additional management problems. They have a slow rate of water infiltration, and most of them are less productive than other soils because they have a lower content of

organic matter. Also, they have high pH values, which limit nutrient availability. The penetration of roots and moisture can be restricted by the dense, compact subsoil in these soils. The management of sodium-affected soils should always include tilling in a timely manner; minimizing tillage; leaving crop residue on the surface, which helps to maintain the content of organic matter; and maintaining tilth. Including grasses and legumes in the rotation helps to maintain the content of organic matter, fertility, and tilth. Chiseling and subsoiling when the soil is dry can increase the rate of water infiltration.

Field crops suited to the soils and climate of the survey area include row crops and small grain. Oats and spring wheat are the main small grain crops. Barley and sunflowers also are grown. Corn and soybeans are the main row crops. Corn is grown mainly for grain, but some is harvested for silage.

All of the commonly grown and climatically adapted crops are suited to the very deep, well drained or moderately well drained soils, such as Alcester, Bonilla, Clarno, Davis, Egan, Grovena, Huntimer, Moody, Nora, Trent, and Wentworth soils. Delmont and Enet soils are better suited to early maturing small grain than to the deeper rooted, late-maturing crops, such as corn and alfalfa. The porous underlying material limits the available water capacity and the depth to which roots can develop. Benclare and Corson soils have a clayey subsoil that retards root growth and restricts the amount of water that is released to plants. These soils are better suited to small grain and alfalfa than to row crops. Thurman soils, which are susceptible to erosion, also are better suited to small grain, which provides better protection than row crops against wind erosion.

Pasture and Hayland

David W. Schmidt, range conservationist, Natural Resources Conservation Service, helped prepare this section.

Pasture and hayland are used for the production of adapted domesticated perennial forage plants to be grazed by livestock or harvested for hay (fig. 13). These forage plants may be either native or introduced species and may be seeded alone or in mixtures. Generally, these species are established as part of a long-term forage program, but in some areas legumes or grasses have been established as part of a short-term crop rotation.

Currently, about 8 percent of the county is classified as pasture and hayland (U.S. Department of Commerce, 1999). This acreage supplies a major portion of the forage for livestock. It includes areas that formerly supported native vegetation but have been invaded by introduced tame grasses, such as smooth bromegrass, because of overgrazing. Managing these sites as native rangeland is no longer practical in many cases. Because of overgrazing, improper management, and poor agronomic practices, much of the pasture or hayland is presently producing well below its potential.

Proper management of pasture and hayland is needed to obtain maximum sustained yields. Proper stocking rates allow the pasture plants to retain their vigor. Overgrazing results in depletion of the root systems of the pasture plants. If continued overgrazing is allowed, the plants will eventually die out and be replaced by less desirable species and by weeds. A planned grazing system that includes periods of adequate rest or deferment for the key pasture species improves plant vigor and thus improves production. Including rest periods between periods of grazing allows the pasture plants to regrow and replenish their energy reserves. Harvesting hay at the proper stage of plant growth also helps to maintain plant vigor. Generally, the plants should be allowed to grow to early or mid bloom stage before they are harvested. Grazing pasture species at the proper stage of growth also increases production. The plants should not be grazed before they have produced enough leaf material to replenish stored energy reserves. Generally, the plants should be allowed to grow to a height of 8 to 14 inches before grazing is initiated. The proper height depends on the species being managed. If the plants become too tall or mature before grazing is allowed, the quality and quantity of the forage can be affected. Also, allowing the plants to regrow before the first killing frost provides adequate energy reserves for survival during the winter and for the initiation of regrowth in the spring. Allowing regrowth also increases the ability of the plants to trap snow, thereby increasing soil moisture.

Pasture and hayland species can be divided into two broad categories. Cool-season species begin their growth early in the spring and reach maturity in early summer. If soil moisture is adequate, they may regrow in the fall when temperatures cool. Cool-season plants include smooth bromegrass, intermediate wheatgrass, and alfalfa. Warm-season species begin growth in early summer. Warm-season species include big bluestem and switchgrass.

Proper management includes the periodic reestablishment of pasture and hayland. The length of time that pasture or hayland remains productive depends on the plant species, the type of soil, climatic factors, and management techniques. Generally, many of the tame species should be replaced every 5 to 10

Figure 13.—An area of Obert silty clay loam, 0 to 1 percent slopes, used for the production of hay.

years. Native species that are adapted to the site generally remain productive for an extended period of time, depending on the kind of management applied. Species selection should be based on the type of soil and on producer needs. Using improved varieties can result in increased production, improved forage quality, and improved stand establishment and longevity of the stand.

Maintaining soil fertility is an important management concern. Applications of fertilizer should be based on the results of soil tests. Care should be taken to prevent the contamination of water supplies. Proper levels of fertilizer can increase production, increase the longevity of the stand, and improve the quality of the forage. Planting legumes, such as alfalfa, in combination with grasses increases the nitrogen level and thus helps to meet the nutrient needs of grass species.

Weeds can be a problem unless proper management techniques are applied. Allowing overgrazing, failing to maintain soil fertility, and selecting species that are not adapted to the site can increase the extent of weeds in areas of pasture and hayland. Weeds should be controlled within economical and environmental constraints.

The soils in the county have been assigned to pasture suitability groups. These groups are listed at the end of each map unit description and in the section “Interpretive Groups.” Pasture suitability groups are based primarily on the suitability of the soil for certain pasture or hayland species, on management needs, and on potential productivity. The principal criteria for assigning a soil to a pasture suitability group include depth, drainage class, texture, structure, permeability, available water capacity, position on the landform, and special internal features. Detailed interpretations for each pasture suitability group in the county are provided in the Field Office Technical Guide, which is available in the local office of the Natural Resources Conservation Service. General descriptions of the pasture suitability groups in this county are provided in the following paragraphs. The descriptions include limitations affecting the use of the soils for pasture or hayland and a list of suitable plant

species. The species are selected based on yield potential, adaptability to the site, palatability, and relative ease of establishment.

Group A.—The soils in this group receive additional moisture from runoff or flooding. All climatically adapted grasses and legumes are suitable, but only plants that are capable of utilizing the extra moisture are recommended.

The soils in this group are artificially drained or have a water table that is seasonally high for only short periods and thus does not adversely affect plant growth. Examples are Arlo, Chancellor, Chaska, Clamo, Crossplain, Lamo, and Obert soils. The species that are most suitable in areas of these soils include alfalfa, big bluestem, creeping foxtail, indiangrass, intermediate wheatgrass, reed canarygrass, smooth bromegrass, orchardgrass, and switchgrass. Maintaining plant vigor and maintaining good soil tilth are the major management concerns. Some of the soils in the group are calcareous to the surface. This characteristic can limit the availability of plant nutrients and can increase the potential for denitrification and agrochemical movement. Proper grazing use, including deferred grazing and timely harvesting, helps to maintain plant vigor. Applications of fertilizer may also be needed. Surface compaction may be a concern during wet periods. Deferring use during these periods helps to minimize compaction and maintain soil tilth.

Group B1.—The soils in this group receive additional moisture from runoff or flooding. Because of excess moisture, the selection of climatically adapted grasses is limited to water-tolerant species.

The soils in this group are not artificially drained and do not have a water table that is seasonally high for prolonged periods. Examples are Clamo and Obert soils. The species that are most suitable in areas of these soils include creeping foxtail and reed canarygrass. The main management concern is surface compaction, which can result from harvesting or grazing during periods when the soils are saturated. Deferring grazing or delaying harvesting can minimize surface compaction and improve plant vigor. Denitrification and the movement of agrochemicals also are concerns in areas of these soils.

Group B2.—The soils in this group receive additional moisture from runoff. Because of excess moisture, the selection of climatically adapted grasses is limited to water-tolerant species.

The soils in this group are not artificially drained. They are mainly very deep and are somewhat poorly drained to very poorly drained. Examples are Baltic, Tetonka, and Worthing soils. The species that are most suitable in areas of these soils include creeping foxtail and reed canarygrass. The main management concern is surface compaction, which can result from harvesting or grazing during periods when the soils are saturated. Deferring grazing or delaying harvesting can minimize surface compaction and improve plant vigor. Denitrification and the movement of agrochemicals also are concerns in areas of these soils.

Group D1.—The soils in this group have a moderately deep root zone and a limited available water capacity, which restrict the selection of climatically adapted grasses and legumes.

The soils in this group are excessively drained to somewhat poorly drained and are moderately deep over sand and gravel. The somewhat poorly drained soils and some of the moderately well drained soils have a water table that is seasonally high for short periods and are calcareous at or near the surface. Typical soils in this group are Dempster and Enet soils. The species that are most suitable in areas of these soils include alfalfa, intermediate wheatgrass, and smooth bromegrass. The major management concerns are maintaining plant vigor and minimizing leaching through proper use of agrochemicals. Proper hayland management and proper grazing use, including deferred grazing or a planned grazing system, help to maintain plant vigor. Applications of fertilizer may also be needed.

Group D2.—The soils in this group have a shallow root zone and a limited available water capacity, which restrict the selection of climatically adapted grasses and legumes.

The soils in this group are excessively drained to moderately well drained and are shallow over sand and gravel. Delmont soils are examples. The species that are most suitable in areas of these soils include crested wheatgrass and pubescent wheatgrass. Maintaining the plant community can be difficult because of the extreme droughtiness and the shallow root zone. Minimizing leaching through proper use of agrochemicals also is a concern. Proper grazing use, deferred grazing, a planned grazing system, and timely harvesting help to maintain plant vigor.

Group E.—The soils in this group have a clayey subsoil and have a high content of soluble salts in the underlying material. An unfavorable root zone limits the selection and productivity of climatically adapted grasses and legumes.

Corson soils are examples of soils in this group. The species that are most suitable in areas of these soils include alfalfa, big bluestem, green needlegrass, indiangrass, intermediate wheatgrass, smooth

bromegrass, and switchgrass. The major management concerns are maintaining plant vigor and maintaining good tilth. Proper grazing use, deferred grazing, a planned grazing system, and proper hayland management improve plant vigor and help to maintain tilth. Applications of fertilizer may also be needed.

Group F.—The soils in this group are suited to all climatically adapted grasses and legumes, but bunch-type grass species are not recommended in areas where the slope is 6 percent or more.

The soils in this group include Alcester, Clarno, Davis, Davison, Egan, Flandreau, Grovena, Ihlen, Moody, Nora, Splitrock, Wakonda, and Wentworth soils. The species that are most suitable in areas of these soils include alfalfa, big bluestem, green needlegrass, indiangrass, intermediate wheatgrass, smooth bromegrass, switchgrass, and little bluestem. The major management concerns are maintaining plant vigor and maintaining good tilth. Proper grazing use, deferred grazing, a planned grazing system, and proper hayland management improve plant vigor and help to maintain tilth. Applications of fertilizer may also be needed.

Group G.—The soils in this group are calcareous within a depth of 10 inches. They range from gently sloping to moderately steep. The selection and productivity of climatically adapted grasses and legumes are limited by the slope, the high content of lime, and the hazard of erosion.

Betts, Crofton, Ethan, and Shindler soils are typical of the soils in this group. The species that are most suitable in areas of these soils include alfalfa, crested wheatgrass, intermediate wheatgrass, pubescent wheatgrass, and smooth bromegrass. The major management concerns are maintaining plant vigor and controlling erosion. The risk of pollution by agrochemicals in runoff from areas of these soils also is a concern. Proper grazing use, deferred grazing, a planned grazing system, and proper hayland management improve plant vigor and help to control erosion. Applications of fertilizer may also be needed.

Group H.—The soils in this group are susceptible to erosion. Also, a limited available water capacity restricts the selection and productivity of climatically adapted grasses and legumes.

The soils in this group include Blendon, Henkin, and Thurman soils. The species that are most suitable in areas of these soils include alfalfa, big bluestem, indiangrass, intermediate wheatgrass, smooth bromegrass, and switchgrass. The major management concerns are maintaining plant vigor and controlling erosion. The risk of pollution by agrochemicals also is a major concern. Proper grazing use, deferred grazing, a planned grazing system, and proper hayland management improve plant vigor and help to control erosion. Applications of fertilizer may also be needed. Agrochemical movement in areas of these soils and in the form of runoff to other areas also is a concern.

Group J.—The soils in this group are characterized by excessive salinity and alkalinity, which severely limit the selection and productivity of climatically adapted grasses and legumes. Also, the soils have a water table that is seasonally high for prolonged periods.

The soils in this group are mainly very deep and are poorly drained or very poorly drained. Salmo soils are typical of the soils in this group. The species that are most suitable in areas of this soil include tall wheatgrass and western wheatgrass. The major management concern is maintaining a desirable plant community. Surface compaction also is a concern if grazing or harvesting is allowed during periods when the soil is saturated. Proper grazing use, deferred grazing, a planned grazing system, and proper hayland management help to maintain plant vigor and ensure the survival of the stand.

Group K.—The soils in this group receive additional moisture from runoff. They have a thick, dark surface layer. They are suited to all of the climatically adapted grasses and legumes.

The soils in this group are mainly very deep, are well drained or moderately well drained, and have medium or moderately fine textures. They include Bon, Bonilla, Davis, and Trent soils. The species that are most suitable in areas of these soils include alfalfa, big bluestem, creeping foxtail, indiangrass, intermediate wheatgrass, reed canarygrass, orchardgrass, smooth bromegrass, and switchgrass. The major management concerns are maintaining plant vigor and maintaining good tilth. Proper grazing use, deferred grazing, a planned grazing system, and proper hayland management improve plant vigor and help to maintain tilth. Applications of fertilizer may also be needed. The movement of agrochemicals in the form of runoff to other areas also is a concern.

Group NS.—The soils in this group are generally not suitable for pasture or hayland plantings because they are very shallow to gravel, are sandy and have a low content of organic matter, are very strongly saline or alkaline, or are clayey and have a dense subsoil. Also included in this group are areas of soils that are so steep that pasture planting is not feasible because of the erosion hazard and the difficulty in establishing erosion-control practices.

Productivity Ratings

Soil productivity ratings are relative ratings of the ability of a soil to produce a particular crop. They are

useful for estimating long-term average crop yields, for comparing the production capacity of soils, and in various economic analyses. The productivity ratings of the soils in Minnehaha County are shown in table 5.

Productivity ratings are based on soil properties that are important to crop production. The experience of soil scientists, conservationists, and university researchers is used to develop the ratings. Results from field trials and demonstrations and the records and experience of producers also are considered.

The ratings developed for this survey are comparative ratings, and they apply to the detailed soil map units in Minnehaha County. The ratings are for local use and may differ from those developed for adjacent or nearby counties.

The data used to determine productivity ratings include crop and range yields, range composition, and other soils information published in this soil survey. Forage use values were provided by the South Dakota Agricultural Experiment Station at South Dakota State University. Four steps are used to calculate the productivity ratings (Malo, 1996). The first step is to determine a comparative crop rating for each map unit that is suitable for crop production. In the second step, the amount of usable grass (range) forage available for each map unit is determined (total range yield multiplied by the forage use value factor). Since not all native forage is usable by livestock, a forage use value factor (based on the plant species that occur) is calculated for each soil series. The third step is to determine the grass/range rating for each map unit. Grass/range ratings are equated to crop ratings by using a balance point factor. The rating is for potential palatable native vegetation. Finally, a soil productivity rating that reflects the highest and best use for each detailed soil map unit is determined. The soil productivity rating is equal to the highest value of either the final crop rating or the grass/range rating.

Because these productivity ratings are based on comparisons of physical and chemical properties of soils, the rating of one soil relative to another soil should not change as a result of fluctuations in economic conditions or advancements in technology. Also, the potential yield advantage of one soil over another generally does not change when a new form of fertilizer, a new grain variety, a new tillage system, or a new pest management program is developed.

Yields per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 6. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, university researchers, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations also are considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 6 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Natural Resources Conservation Service, the South Dakota Cooperative Extension Service, or the South Dakota Agricultural Experiment Station at South Dakota State University can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for pasture and hayland, rangeland, or woodland or for engineering purposes.

In the capability system, soils are generally grouped at three levels—capability class, subclass, and unit

(USDA, 1961). Only class and subclass are used in this survey.

Capability classes, the broadest groups, are designated by the numbers 1 through 8. The numbers indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class 1 soils have few limitations or hazards that restrict their use.

Class 2 soils have moderate limitations or hazards that reduce the choice of plants or that require moderate conservation practices.

Class 3 soils have severe limitations or hazards that reduce the choice of plants or that require special conservation practices, or both.

Class 4 soils have very severe limitations or hazards that reduce the choice of plants or that require very careful management, or both.

Class 5 soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class 6 soils have severe limitations or hazards that make them generally unsuitable for cultivation.

Class 7 soils have very severe limitations or hazards that make them unsuitable for cultivation.

Class 8 soils and miscellaneous areas have limitations or hazards that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, 2e. The letter *e* shows that the main hazard is the risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation; *s* shows that the soil has a root zone limitation mainly because it is too shallow, too sandy, or too rocky; and *c,* used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class 1 there are no subclasses because the soils of this class have few limitations or hazards. Class 5 contains only the subclasses indicated by *w, s,* or *c* because the soils in class 5 are subject to little or no erosion. They have other limitations or hazards that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

The capability classification of the map units in the survey area is given in the detailed soil map unit descriptions and in the “Interpretive Groups” section, which follows the tables at the back of this survey.

Prime Farmland

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in meeting the Nation’s short- and long-range needs for food and fiber. Because the supply of high-quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation’s prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. It could be cultivated land, pastureland, forest land, or other land, but it is not urban or built-up land or water areas. The soil qualities, growing season, and moisture supply are those needed for the soil to economically produce sustained high yields of crops when proper management, including water management, and acceptable farming methods are applied. In general, prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, an acceptable salt and sodium content, and few or no rocks. It is permeable to water and air. It is not excessively erodible or saturated with water for long periods, and it either is not frequently flooded during the growing season or is protected from flooding. The slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at the local office of the Natural Resources Conservation Service.

About 301,735 acres in the survey area, or nearly 58 percent of the total acreage, meets the soil requirements for prime farmland. Scattered areas of this land are throughout the county. Almost all the prime farmland is used for crops, mainly corn, soybeans, small grain, and alfalfa.

A recent trend in land use in some parts of the survey area has been the loss of some prime farmland to industrial and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, and less productive and cannot be easily cultivated.

The map units in the survey area that are considered prime farmland are listed in table 7. This list does not constitute a recommendation for a particular land use. On some soils included in the list, measures that overcome a hazard or limitation, such as flooding, wetness, and droughtiness, are needed. Onsite evaluation is needed to determine whether or not the hazard or limitation has been overcome by corrective measures. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps. The soil qualities that affect use

and management are described under the heading “Detailed Soil Map Units.”

Rangeland

David W. Schmidt, range conservationist, Natural Resources Conservation Service, helped prepare this section.

Rangeland supports native vegetation suitable for grazing or browsing. It includes areas where native vegetation has been reestablished. The vegetation is mainly grasses, grasslike plants, forbs, or shrubs. The amounts and kinds of native vegetation in any one area are determined by the soil, topography, climate, past use, and management.

Nearly all of the county was rangeland before the first permanent settlers arrived. Currently, about 2.5 percent of the county supports native range vegetation (USDA, 1992). This rangeland supplies a portion of the forage for livestock in the county. Approximately 58 percent of the farm and ranch income in the county is derived from the sale of livestock and livestock products (U.S. Department of Commerce, 1999). Most of the livestock enterprises are cow-calf operations. Some are yearling operations, and some combine cow herds with yearlings. This latter practice permits greater flexibility in adjusting livestock numbers during periods of drought. Sheep are raised in limited numbers throughout the county and are commonly run in combination with cow herds. The rangeland is generally grazed from May to October. The forage provided by rangeland is generally supplemented by crop aftermath and tame pasture plants, such as intermediate wheatgrass, orchardgrass, and smooth bromegrass. In winter the forage is supplemented by protein concentrate and hay.

Minnehaha County is part of the tall grass prairie. The native vegetation is dominated by tall and mid grasses and forbs (Baumberger, 1977). Common tall grass species include big bluestem, switchgrass, and prairie dropseed. Mid grasses include little bluestem, sideoats grama, and needlegrasses. Goldenrod and prairie-clover are common forbs. The tall grass prairie consists of cool- and warm-season plants, which provide high-quality forage throughout the growing season. The cool-season plants grow mostly during April, May, and June and include such plants as porcupinegrass. The warm-season plants grow mostly during June, July, and August and include such plants as big bluestem. The cool-season grasses may start growing again in September and October if rainfall is adequate.

The native vegetation in many parts of the county is producing below its potential because of past management. The tall grasses and some of the mid grasses have been replaced by less desirable plants. In many areas of the county, the past misuse of the native vegetation has resulted in an invasion of cool-season tame grasses, namely smooth bromegrass and Kentucky bluegrass. As a result, the amount of available forage is reduced. In most areas, however, enough of the original plants remain for the reestablishment of high-quality native plants if good management practices are applied.

Range Sites and Condition Classes

Different kinds of soil vary in their capacity to produce native vegetation. Soil properties that affect moisture supply and plant nutrients have the greatest influence on the productivity of range plants. Soil reaction, salt content, and a seasonal high water table also are important. Soils that produce approximately the same kinds, amounts, and proportions of native vegetation make up a range site. The potential native vegetation on a range site is the stabilized plant community that the site is capable of producing. It consists of the plants that were growing on the site when the region was settled. This plant community maintains itself and changes very little as long as the environment remains unchanged. The relationship between soils and vegetation was ascertained during this survey; thus, range sites generally can be determined directly from the soil maps.

The plants within the native plant community are sometimes grouped as decreasers, increasers, and invaders, depending on their response to grazing pressure. Decreasers are plants that respond to overgrazing by decreasing in abundance. They generally are the most productive plants and the ones most preferred by the grazing animals. Increasers are plants that respond to grazing pressure, at least initially, by increasing in amount as the more desirable decreaser plants become less abundant. Increasers generally are less productive and less preferred by the grazing animal. Invaders are plants that are not part of the original plant community but invade because of some kind of disturbance or continued overgrazing. Some invader plants have little or no value for grazing.

Because plants do not respond in the same manner to different influences, a plant may be a decreaser on some range sites but an increaser on others. A cool-season plant, for example, may be a decreaser if the site is grazed only during the spring but would be an increaser if the same site were grazed only during the summer. The reverse would be true for the warm-season plants. Restricting grazing to the spring would cause the warm-season plants to increase in

abundance, and restricting grazing to the summer would cause them to decrease.

Table 8 shows, for the soils in the county, the range site; the composition of species in the potential natural plant community; and the potential annual production of vegetation in favorable, average, and unfavorable years. *Potential annual production* is the amount of vegetation that can be expected to grow annually on well managed rangeland that is supporting the potential natural plant community. It includes all vegetation, whether or not it is palatable to grazing animals. It includes the current year's growth of leaf, twigs, and fruits of woody plants. It does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation for favorable, average, and unfavorable years. In a favorable year, the amount and distribution of precipitation and the temperature make growing conditions substantially better than average. In an unfavorable year, growing conditions are well below average, generally because of low available soil moisture.

Yields are adjusted to a common percent of air-dry moisture content. The relationship of green weight to air-dry weight varies according to such factors as exposure, amount of shade, recent rains, and unseasonable dry periods.

Range management maintains the capacity of the rangeland to produce forage for livestock and game animals and to provide wildlife habitat, water, and watershed protection. The primary objective of good range management is to keep the rangeland in excellent or good condition. The main management concern is responding to important changes in the plant community of a range site.

Range condition is determined by comparing the present vegetation on a range site with the potential native plant community for the site. Four range condition classes are recognized. The range site is in *excellent* condition if 76 to 100 percent of the present vegetation is the same kind as the potential native vegetation; in *good* condition if the percentage is 51 to 75; in *fair* condition if the percentage is 26 to 50; and in *poor* condition if the percentage is 25 or less. The potential production depends on the range site, the range condition, and the moisture available to plants during the growing season.

Measures that maintain or improve the range condition are needed on all of the rangeland in the county. They include proper stocking rates and rotation or deferred grazing systems. These systems provide rest periods that maintain or improve the vigor of the key plants. Good range management also includes range seeding, fencing, and measures that provide water for livestock.

The soils in the county are assigned to 14 different range sites. These range sites are described in the following paragraphs.

Clayey range site.—The potential native vegetation on this site is a mixture of tall and mid grasses interspersed with a variety of forbs. Big bluestem and little bluestem, which are warm-season grasses, make up about 50 percent of the vegetation in about equal proportions. Needlegrasses and western wheatgrass are the dominant cool-season grasses. They make up about 25 percent of the vegetation. Other grasses that occur in areas of this range site include sideoats grama, blue grama, and grasslike sedges. Forbs, such as sageworts, heath aster, false boneset, and yarrow, are common but generally make up less than 10 percent of the vegetation. The soils in areas of this range site have a clayey subsoil and slow or very slow permeability. Corson soils are examples.

The major management concern on this site is maintaining the extent of the most productive grasses. Big bluestem, little bluestem, and needlegrasses rapidly lose their productive capacity after continued overgrazing because the livestock prefer these plants. Western wheatgrass, sideoats grama, and blue grama increase in abundance if overgrazing is allowed. Kentucky bluegrass and/or blue grama become dominant after continued overgrazing. Low forage production is the result. The extent of the most productive grasses can be increased or maintained by proper stocking rates and by a deferred grazing or rotation grazing program, which provides rest periods during the key growing season of the desirable plants. Limiting grazing in these areas when the soils are wet helps to prevent surface compaction.

Limy Subirrigated range site.—The potential native vegetation on this site is an excellent stand of warm-season, tall and mid grasses. Little bluestem makes up about 40 percent of the vegetation. A combination of big bluestem, indiangrass, and switchgrass makes up about 35 percent; prairie dropseed, which makes up 10 percent; sideoats grama, which makes up 5 percent; and sedges and forbs, which make up 10 percent. This site is less productive than the Subirrigated site because of the seasonal high water table and the high content of lime in the soils. Davison and Wakonda soils are typical of the soils on this site.

The major management concern on this site is maintaining the extent of the most productive grasses. Big bluestem, indiangrass, switchgrass, and prairie

dropseed lose their productive capacity and thin out after continuous grazing because the livestock prefer these plants. As the extent of these plants decreases, the extent of little bluestem and sideoats grama initially increases. After continuous overgrazing, however, bluegrasses, sedges, and downy brome become the principal plants on the site. Low forage production is the result. The extent of the most productive grasses can be increased or maintained by proper stocking rates and by a deferred grazing or rotation grazing program, which provides rest periods during the key growing season of the desirable plants.

Loamy Overflow range site.—The potential native vegetation on this site is tall, warm-season prairie grasses. About 70 percent of the forage is a combination of big bluestem, indiangrass, and switchgrass, all of which are tall, warm-season grasses. Warm-season, mid grasses, such as little bluestem and sideoats grama, make up about 15 percent of the vegetation. Forbs, such as Maximilian sunflower, stiff sunflower, tall gayfeather, and goldenrod, make up about 10 percent, and leadplant, wild rose, and sedges make up about 5 percent. The soils in areas of this range site regularly benefit from stream overflow or run-on from the higher areas, but agrochemical movement is a potential hazard. Typical soils are Alcester, Bon, Bonilla, Chancellor, Crossplain, Trent, and Whitewood soils.

Big bluestem, switchgrass, indiangrass, Maximilian sunflower, and stiff sunflower lose their productive capacity and thin out after continuous grazing because the livestock prefer these plants. As the extent of these plants decreases, the extent of little bluestem and sideoats grama initially increases. After continuous overgrazing, however, Kentucky bluegrass, a short, cool-season grass, becomes the principal plant on the site. Low forage production is the result. The extent of the most productive grasses can be increased or maintained by proper stocking rates and by a deferred grazing or rotation grazing program, which provides rest periods during the key growing season of the desirable plants.

Saline Lowland range site.—The climax plant cover is made up of species that have a tolerance for salinity. Cordgrasses typically dominate the site and make up about 60 percent of the vegetation. Other grasses include Nuttall alkaligrass, western wheatgrass, alkali muhly, and foxtail barley. Sedges and forbs occur in small amounts, and woody plants seldom grow in areas of this range site. The soils typically have a concentration of soluble salts that can affect the kind of vegetation. Gayville soils are typical of the soils on this site.

The major management concern on this site is maintaining the most productive grasses. Cordgrass and Nuttall alkaligrass rapidly lose vigor and density if continued overgrazing is allowed. As a result, saltgrass increases in extent and becomes the principal grass on the site. Because this species is characterized by lower productivity and low palatability in most seasons, forage production on the site is greatly reduced. The content of salt may reduce the availability of selected nutrients.

Saline Subirrigated range site.—The potential native vegetation on this site is an excellent stand of warm-season, tall and mid grasses. Little bluestem makes up about 45 percent of the vegetation. Other plants include big bluestem, which makes up about 20 percent; indiangrass, which makes up 10 percent; switchgrass, which makes up 10 percent; and sedges and forbs, which make up 10 percent. The soils on this site have accumulations of salt and have a high water table. Salmo soils are examples.

The plant community on this site is very fragile. Big bluestem, little bluestem, indiangrass, and switchgrass rapidly lose their productive capacity and thin out after continuous grazing because livestock prefer these plants. As the extent of these plants decreases, inland saltgrass and foxtail barley become the principal plants on the site. Low forage production is the result. The extent of the most productive grasses can be increased or maintained by proper stocking rates and by a deferred grazing or rotation grazing program, which provides rest periods during the key growing season of the desirable plants. The accumulation of salts may reduce the availability of plant nutrients, and denitrification is a potential hazard.

Sandy range site.—The potential native vegetation on this site is dominated by tall and mid, warm-season grasses. Big bluestem, sand bluestem, prairie sandreed, and switchgrass make up about 50 percent of the vegetation. Sideoats grama and little bluestem make up about 20 percent. Needleandthread, porcupinegrass, and Canada wildrye, which are cool-season grasses, make up about 15 percent. Forbs, such as heath aster, scurfpea, and perennial sunflowers, and shrubs, such as wild rose and leadplant, make up about 15 percent. The soils on this site have a surface layer of fine sandy loam. Typical soils are Blendon, Henkin, Janude, and Thurman soils.

The major management concern on this site is maintaining the extent of the most productive grasses. The extent of sand bluestem, switchgrass, and porcupinegrass decreases after continuous grazing because the livestock prefer these plants. The extent of prairie sandreed, needleandthread, little bluestem, and sideoats grama initially increases as that of the other grasses decreases. After continuous

overgrazing, these grasses thin out and are replaced by blue grama and Kentucky bluegrass. Low forage production is the result. The extent of the most productive grasses can be increased or maintained by proper stocking rates and by a deferred grazing or rotation grazing program, which provides rest periods during the key growing season of these plants.

Shallow Marsh range site.—This site is ponded in spring and early summer. The potential native vegetation is water-tolerant, tall prairie grasses and sedges. Bluejoint reedgrass and slough sedge make up about 70 percent of the vegetation. Cattails, common spikesedge, prairie cordgrass, and reedgrass make up about 20 percent. Forbs, such as smartweed and waterplantain, make up about 10 percent. Baltic and Worthing soils are typical of the soils on this site.

The major management concern on this site is maintaining the extent of the most productive plants. After continued overgrazing, bluejoint reedgrass and slough sedge are replaced by spikesedge and other grasslike plants that are less palatable to livestock. An increase in the abundance of the less palatable vegetation results in a loss of available forage. The extent of the most productive plants can be maintained by proper stocking rates and by a deferred grazing program, which provides rest periods during the key growing season of these plants. Allowing grazing when the soils are wet can result in surface compaction. Also, these soils have a potential for denitrification.

Shallow to Gravel range site.—The potential native vegetation on this site is mid prairie grasses. Needleandthread, a cool-season grass, makes up about 30 percent of the vegetation. Warm-season grasses make up about 50 percent. These include little bluestem, plains muhly, sideoats grama, and prairie dropseed, which make up 40 percent of the vegetation, and blue grama and hairy grama, which make up 10 percent. Sedges, forbs, and shrubs make up about 20 percent. The soils on this site are underlain by sand and gravel at a depth of 10 to 20 inches. They have a low available water capacity. Delmont soils are examples.

The major management concern on this site is maintaining the extent of the most productive plants. Needleandthread, little bluestem, plains muhly, sideoats grama, and prairie dropseed rapidly thin out after continuous overgrazing. When the extent of these grasses decreases, the extent of sedges, blue grama, and hairy grama increases. If overgrazing continues, the productivity of the site is greatly reduced. The extent of the most productive grasses can be maintained by proper stocking rates and by a rotation grazing or deferred grazing program, which provides rest periods during the key growing season of these plants. The soils on this site have a potential for agrochemical leaching.

Silty range site.—The potential native vegetation on this site is tall and mid grasses and a large number of forbs. Cool-season grasses make up about 20 percent of the vegetation. These include green needlegrass, porcupinegrass, and bearded wheatgrass. Warm-season grasses, such as little bluestem, big bluestem, prairie dropseed, switchgrass, and indiangrass, make up about 60 percent of the vegetation. Forbs, such as blacksamson, dotted gayfeather, stiff sunflower, heath aster, and prairie clover, and shrubs, such as leadplant, rose, and western snowberry, make up about 20 percent. The soils in areas of this range site have a silty or loamy surface layer and subsoil. Typical soils are Clarno, Dempster, Egan, Enet, Flandreau, Houdek, Huntimer, Moody, Nora, and Wentworth soils.

The major management concern on this site is maintaining the extent of the most productive plants. After continuous grazing, the extent of big bluestem, indiangrass, prairie dropseed, porcupinegrass, and green needlegrass decreases because the livestock prefer these plants. The extent of little bluestem and sideoats grama initially increases after continuous grazing. After continuous overgrazing, however, short grasses, such as blue grama, annual bromes, and Kentucky bluegrass, become the dominant plants. Low forage production is the result. The extent of the most productive grasses can be increased or maintained by proper stocking rates and by a deferred grazing or rotation grazing program, which provides rest periods during the key growing season of the desirable plants.

Subirrigated range site.—The potential native vegetation on this site is dominantly tall, warm-season grasses. Big bluestem, the dominant warm-season grass, makes up about 60 percent of the vegetation. Prairie cordgrass, switchgrass, indiangrass, and little bluestem make up about 20 percent. Forbs, such as American licorice, Maximilian sunflower, downy gentian, Canada milkvetch, heath aster, and Missouri goldenrod, make up about 15 percent. The soils in areas of this range site have a water table within a depth of 36 to 60 inches during most of the growing season. The water table is at the surface at times during the spring. These soils have a potential for denitrification. Arlo, Chaska, and Lamo soils are examples.

The major management concern on this site is maintaining the extent of the most productive plants. After continuous grazing, the extent of big bluestem, indiangrass, switchgrass, and forbs, such as Maximilian sunflower, decreases because the livestock prefer these plants. The extent of little

bluestem, sideoats grama, and sedges initially increases after continuous grazing. After continuous overgrazing, however, short grasses, such as Kentucky bluegrass, downy brome, and sedges, become the dominant plants. Low forage production is the result. The extent of the most productive tall grasses can be maintained by proper stocking rates and by a rotation grazing or deferred grazing program, which provides rest periods during the key growing season of these plants.

Thin Upland range site.—The potential native vegetation on this site is tall and mid grasses and a large number of forbs. Warm-season grasses make up 70 percent of the vegetation. These include little bluestem, which makes up 30 percent; prairie dropseed, big bluestem, switchgrass, indiangrass, and plains muhly, which make up 30 percent; and sideoats grama, which makes up 10 percent. Cool-season grasses, such as green needlegrass, porcupinegrass, and needleandthread, make up about 10 percent. Forbs, such as pasqueflower, dotted gayfeather, and blacksamson, and woody plants, such as leadplant and rose, make up about 20 percent. The soils in areas of this range site have a thin, calcareous surface layer. Betts, Crofton, Ethan, and Steinauer soils are examples.

The major management concern on this site is maintaining the extent of the most productive plants. Indiangrass, prairie dropseed, big bluestem, porcupinegrass, and plains muhly lose their productive capacity and thin out after continuous grazing because the livestock prefer these plants. The extent of little bluestem, sideoats grama, and needleandthread initially increases as the other grasses thin out. After continuous overgrazing, short grasses, such as blue grama, dominate the site. Low forage production is the result. The extent of the most productive grasses can be increased or maintained by proper stocking rates and by a deferred grazing or rotation grazing program, which provides rest periods during the key growing season of the desirable plants.

Very Shallow range site.—The potential native vegetation on this site is mid and short grasses. Needleandthread, plains muhly, and sideoats grama, the dominant mid grasses, make up about 50 percent of the vegetation. Short grasses, such as blue grama and hairy grama, and sedges make up about 30 percent. Forbs, such as dotted gayfeather, blacksamson, and sagewort, and shrubs, such as leadplant and rose, make up about 20 percent. The soils in areas of this range site are underlain by sand and gravel at a depth of less than 10 inches. They have a potential for agrochemical leaching. Talmo soils are examples.

The major management concern on this site is maintaining the extent of the most productive plants. If overgrazing is allowed, the site rapidly deteriorates to a stand of grama grasses, threadleaf sedge, and a few unpalatable forbs. If overgrazing continues, the stand of short grasses may thin out and much of the site is subject to erosion. A productive cover of grasses can be maintained by proper stocking rates and by a deferred grazing or rotation grazing program, which provides rest periods during the key growing season of the desirable plants.

Wet Meadow range site.—This range site has the potential to produce a luxuriant stand of sedges and mid or tall grasses. Sedges, such as woolly sedge, are abundant. Prairie cordgrass, reedgrasses, fowl bluegrass, and reed canarygrass commonly occur in significant amounts. Forbs, such as smartweed and false aster, occur in small amounts. Shrubs and trees are rare. Tetonka soils are typical of the soils on this site.

The major management concern on this site is maintaining the most palatable plants. Some areas are not usable by livestock during the spring and early summer because they are commonly ponded for about 4 to 8 weeks after periods of snowmelt or heavy rainfall. If continued overgrazing is allowed, the grasses and the more palatable sedges decrease in abundance and the extent of the less palatable spikesedge and rushes increases. Weedy grasses, such as foxtail barley, invade. Low forage production is the result. The more productive grasses can be maintained by using proper stocking rates and by using a rotation grazing or deferred grazing system, which provides rest periods during the key growing season of the desirable plants. Surface compaction can be a problem if grazing is allowed during wet periods. These soils have a potential for denitrification.

Wetland range site.—This range site has the potential to produce a luxuriant stand of grasses that tolerate a high water table. Because areas of this site are often under water during the spring, their use is limited to summer and fall. Prairie cordgrass is the dominant species. It makes up about 70 percent of the vegetation. Reedgrasses, reed canarygrass, switchgrass, Canada wildrye, bluegrasses, and sedges also grow on this site. They generally make up less than 25 percent of the vegetation. Forbs, such as asters, waterhemlock, and giant goldenrod, and shrubs, such as false indigo and willows, occur in small amounts. Clamo and Obert soils are typical of the soils on this site.

The major management concern on this site is maintaining the extent of the most productive plants. If continued overgrazing is allowed, the stand of climax

grasses loses vigor and density and sedges, rushes, Kentucky bluegrass, and saltgrass increase or invade. A less productivity plant community is the result. The most productive grasses can be maintained by using proper stocking rates and by using a rotation grazing or deferred grazing system, which provides rest periods during the key growing season of the desirable plants. If grazing is allowed on this site during periods when the soils are wet, surface compaction is a concern. These soils have a potential for denitrification.

Native Woodland, Windbreaks, and Environmental Plantings

Gregory F. Yapp, forester, Natural Resources Conservation Service, helped prepare this section.

Native trees and shrubs grow on about 3,000 acres in Minnehaha County. Most of the larger wooded areas are along the Big Sioux River. Other areas are on flood plains along the smaller drainageways and on Houdek and Shindler soils in the draws and on hillsides adjacent to the flood plains (fig. 14). The soils that support trees and shrubs are not classified as woodland soils. They are grassland soils, which formed under a grassland influence. Before the area was settled, periodic fires prevented the widespread establishment of trees and shrubs. Since the county was settled, however, and fire-control measures have been used, trees and shrubs have been established in some areas. Isolated trees and shrubs grow in small clumps and larger groves. Bur oak, green ash, eastern cottonwood, common chokecherry, hackberry, American elm, American plum, smooth sumac, western snowberry, boxelder, basswood, false indigo, sandbar willow, and peachleaf willow are some of the more common species in the survey area. Some of the more water-tolerant species, such as green ash, willows, eastern cottonwood, American elm, and

Figure 14.—Bur oak is the dominant species in wooded areas of Shindler-Houdek clay loams, 15 to 40 percent slopes.

boxelder, grow on Chaska and Lamo soils on the flood plains along the major creeks and along the margins of sloughs and wetlands. Green ash, American elm, and boxelder are water tolerant for only very short periods of time. Most of the wooded areas are used for recreation or as wildlife habitat. Some areas are periodically grazed by livestock.

Windbreaks have been planted over the years to protect livestock, buildings, and yards from wind and snow. In addition, these plantings provide important winter cover for wildlife. Several rows of broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, help to keep snow on the fields, and provide food and cover for wildlife. This type of windbreak may consist of one row or multiple rows of adapted tree and shrub species.

Farmstead and feedlot windbreaks are planted to protect buildings and livestock from severe winter weather, which is common in Minnehaha County. Along with other environmental plantings, these windbreaks also help to beautify farmsteads and reduce noise levels. They generally consist of multiple rows of adapted trees and shrubs. Many of the older plantings in the county have been neglected and are in need of renovation. This renovation may include additional plantings adjacent to the existing windbreaks and the control of grasses in the older windbreaks. Competition by grass species, such as smooth bromegrass, in the windbreaks is a major factor in the decline of windbreaks within the county. This competition can be controlled with herbicides or cultural methods (fig. 15). To ensure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Table 9 shows suitable trees and shrubs for planting as well as the expected 20-year height of the species on the various soil types in the county.

At the end of each map unit description under the heading “Detailed Soil Map Units” and in the section “Interpretive Groups,” the soils are assigned to windbreak suitability groups. A windbreak suitability group is a distinctive group of soils that supports trees and shrubs having similar growth and survival rates if weather conditions are normal and the windbreak is properly managed. The relationship between the soils and the growth of trees and shrubs was ascertained during this survey. Soil properties that affect moisture supply and plant nutrients have the greatest influence on the growth of trees and shrubs. Soil reaction, salt content, and a seasonal high water table also are important. The windbreak suitability groups in this survey area are described in the following paragraphs.

Group 1.—The soils in this group are well suited to woody plantings. They are on footslopes and high flood plains. They receive additional moisture from runoff and flooding. Some areas are irrigated. All climatically suited trees and shrubs grow well.

This group consists mainly of loamy, silty, and clayey, somewhat poorly drained to well drained soils that are deep or very deep. Available water capacity is moderate or high. The fine sandy loams and loamy fine sands are subject to severe wind erosion. A high pH level can affect the selection of species in areas of soils in subgroup 1K. Typical soils in group 1 are Alcester, Bonilla, Davis, and Trent soils.

Group 2.—The soils in this group are moderately suited to woody plantings. They are on toeslopes and in basins. They receive additional moisture from runoff or have a high water table within the root zone. Wetness limits the selection of species suitable for planting on these soils and may affect the growth rate. A high pH level limits the selection of species in areas of soils in subgroup 2K.

This group consists of very deep, sandy, silty, loamy, and clayey, somewhat poorly drained, poorly drained, or very poorly drained soils. Available water capacity is high. The soils are excessively wet or may be ponded in the spring or during overflow periods. The sandy loams and loamy fine sands are subject to severe wind erosion. Typical soils are Chancellor, Crossplain, and Whitewood soils.

Group 3.—The soils in this group are well suited to woody plantings. They are on summits, shoulders, backslopes, and footslopes. Except for those that require abundant moisture, all climatically suited trees and shrubs grow well.

This group consists of very deep, loamy and silty, well drained soils. Available water capacity is moderate or high. The susceptibility to water erosion ranges from slight in the nearly level areas to severe in the strongly sloping areas. The susceptibility to wind erosion ranges from slight to severe. Typical soils are Clarno, Egan, Grovena, Houdek, Moody, Nora, Splitrock, and Wentworth soils.

Group 4.—The soils in this group are fairly well suited to woody plantings. They are on summits, backslopes, and footslopes. Most of the climatically suited trees and shrubs grow well; however, maximum growth is not possible because of limited root development.

This group consists of very deep, clayey soils and clayey soils that have a loamy or silty surface layer.

Figure 15.—A well cultivated young windbreak in an area of Moody-Nora silty clay loams, 2 to 6 percent slopes.

The soils are moderately well drained or well drained. Available water capacity is low or moderate in the more clayey soils and moderate or high in the silty and loamy soils. The clayey soils are subject to severe wind erosion and to surface compaction during wet periods. Soils having accumulations of salts in the lower part of the subsoil also are in this group. The moderately sloping and strongly sloping soils are subject to severe water erosion. Typical soils are Benclare and Corson soils.

Group 5.—The soils in this group are well suited to woody plantings. They are on summits, backslopes, and footslopes. All climatically suited trees and shrubs grow well, except those that require abundant moisture.

This group consists mainly of very deep, loamy and sandy, well drained and somewhat excessively drained soils. Available water capacity generally is low or moderate. The soils are subject to severe or very severe wind erosion. They have a potential for agrochemical leaching. Typical soils are Blendon, Henkin, and Thurman soils.

Group 6.—The soils in this group are poorly suited to woody plantings. They are on summits, shoulders, backslopes, and footslopes. No trees and shrubs grow well on the soils in this group. Plantings can be established, but optimum survival and growth should not be expected. Field windbreaks are not effective because of the slow growth rate and the low height at maturity.

This group consists of silty and loamy, well drained and somewhat excessively drained soils that are moderately deep to bedrock or are shallow or moderately deep to sand and gravel. Available water capacity is low or moderate. The moderately sloping and strongly sloping soils are subject to severe erosion. The soils in this group have a potential for agrochemical leaching. Typical soils are Delmont, Dempster, Enet, and Ihlen soils.

Group 7.—The soils in this group are poorly suited to woody plantings. They are on summits and shoulders. No trees or shrubs grow well. Coniferous trees and shrubs are better suited than deciduous trees and shrubs. Plantings can be established, but optimum survival and growth should not be expected. Field windbreaks are not effective because of the slow growth rate and the low height at maturity.

This group consists of very deep, sandy, somewhat excessively drained soils. Available water capacity is very low or low. The soils are subject to very severe

wind erosion. None of the soils in Minnehaha County are in this group.

Group 8.—The soils in this group are poorly suited to woody plantings. They are on shoulders and backslopes. No trees and shrubs grow well. Plantings can be established, but optimum survival and growth should not be expected. Field windbreaks are not effective because of the slow growth rate and the low height at maturity.

This group consists of very deep, loamy and silty, well drained soils that contain enough calcium carbonate at or near the surface to adversely affect the growth and survival of trees and shrubs. Available water capacity is moderate or high. The soils are subject to severe wind erosion and water erosion. Typical soils are Betts, Crofton, Ethan, and Shindler soils.

Group 9.—The soils in this group are poorly suited to woody plantings. They have a dense claypan subsoil and an excessive amount of salts (especially sodium) in the lower part of the subsoil. They are on high flood plains. No trees and shrubs grow well because of the adverse effects of the dense claypan subsoil and the salts. The soils are subject to surface compaction during wet periods.

This group consists of deep and very deep, silty and loamy, somewhat poorly drained soils. Available water capacity is low or moderate. Gayville soils are typical of the soils in this group.

Group 10.—The soils in this group generally are unsuited to woody plantings. They are shallow to bedrock, very shallow to gravel, very saline, very alkaline, stony, or very wet. Specialized plantings for wildlife, recreation, or beautification may be established in some areas. The most favorable sites should be selected, and only those trees and shrubs that have the best potential to survive and grow should be planted.

The soils in this group have a wide range in texture, depth, drainage, available water capacity, permeability, salinity, and slope characteristics. Susceptibility to water erosion and wind erosion ranges from slight to very severe. Clayey soils are subject to surface compaction. The sandy soils and soils that are underlain by sand and gravel and may be susceptible to runoff from the higher areas have a potential for agrochemical leaching. Denitrification is a concern in areas of wet soils. Typical soils in this group are Baltic, Obert, Steinauer, Talmo, Tetonka, and Worthing soils.

Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from the local offices of the Natural Resources Conservation Service, the South Dakota Cooperative Extension Service, or the South Dakota Agricultural Experiment Station at South Dakota State University or from a commercial nursery.

Recreation

The soils of the survey area are rated in table 10 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation also are important. Soils subject to flooding are limited for recreational uses by the duration and intensity of flooding and the season when flooding occurs. In planning recreational facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 10, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or a combination of these measures.

The information in table 10 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 13 and interpretations for dwellings without basements and for local roads and streets in table 12.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding or ponding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Excessive slope and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to

flooding or ponding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding or ponding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding or ponding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Wildlife Habitat

Connie M. Vicuna, biologist, Natural Resources Conservation Service, helped prepare this section.

Minnehaha County provides a variety of wildlife habitat types. The most prominent are those associated with cropland and wetlands. Common wildlife species include whitetail deer, gray partridge, doves, sharptail grouse, cottontail rabbits, squirrels, pheasants, ducks, geese, other waterbirds, beaver, mink, muskrats, fox, coyotes, and raccoon. Fisheries in the county are associated with the many ponds, lakes, and streams.

Cropland dominates the agricultural landscape in Minnehaha County. Such areas can provide winter food supplies if a cover of crop residue is maintained throughout the winter. No-till farming can improve the value of cropland as wildlife habitat. Erosion-control and water quality practices, such as grassed waterways and terraces, also enhance wildlife habitat in areas of cropland.

Wetlands are numerous throughout Minnehaha County. They include potholes and flood plains along streams and rivers. Potholes are very common in the western half of the county. The size of the wetlands ranges from less than 0.1 acre to several hundred acres. Water regimes are equally variable and include temporary to permanent bodies of water. The great variety and number of wetlands in this area make it extremely attractive to waterfowl. Ducks, geese, grebes, herons, and other waterbirds are abundant residents from spring through fall.

Grassy habitat is limited in extent. The areas of rangeland are very limited, and hayland and pasture are generally used intensively in this area. The lack of good grassy cover is a significant result of current land use patterns and is an important habitat limitation for many of the wildlife species that originally inhabited this area. If new wildlife habitat developments are considered, providing undisturbed grassy cover is an important consideration.

Native woody habitat in the survey area is on the flood plains and adjacent slopes, streams, and rivers and around some wetlands and lakes. Although they are not abundant, these shrubby and wooded areas are very important for many wildlife species. They provide either food or cover during some part of the year. Farmstead and field windbreaks (fig. 16) are common and provide many of the same benefits if they include evergreens and fruit-producing species.

Soils affect the kind and amount of vegetation and water that are available to wildlife for food and cover; therefore, they also affect the distribution and abundance of wildlife. Wildlife abundance depends on the amount and distribution of food, cover, and water. An understanding of soil capabilities is important in the development of wildlife habitat through planting desirable vegetation, maintaining existing vegetation, and promoting natural establishment of desirable plants.

Because of the topographic units they represent and the capabilities of the soils to produce and maintain vegetation, soil associations provide an indication of actual and potential distribution and density of wildlife and their habitat. Land use and management practices have a primary influence on wildlife. These practices also are influenced by the soils and often correlate with soil associations. The soil associations in Minnehaha County are described under the heading “General Soil Map Units.”

Individual soils have different potentials for the development and maintenance of wildlife habitat elements. The soils, therefore, influence the degree or extent to which wildlife habitat can be established or improved. The soils of Minnehaha County are rated in table 11 according to their potential to provide each of the wildlife habitat elements. This information can be used in planning parks, wildlife areas, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat. The ratings, described in the following paragraphs, indicate the ease of establishing or maintaining these elements.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or

Figure 16.—This established windbreak in an area of Flandreau loam, 0 to 2 percent slopes, provides cover for wildlife and holds drifting snow.

maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs:

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Their primary use is as food sources, although small grain crops also provide some nesting cover. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, salinity, soil reaction, slope, surface stoniness, ponding, and flooding. Soil temperature and soil moisture also are considerations. Examples of grain and seed crops important to wildlife in Minnehaha County are corn, sorghum, wheat, and oats.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. The primary use of this habitat is as nesting and roosting cover. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, salinity, surface stoniness, ponding, soil reaction, flooding, and slope. Soil temperature and soil moisture also are considerations. Examples of grasses and legumes are intermediate wheatgrass, bromegrass, and alfalfa.

Native herbaceous plants are native or naturally established grasses and forbs, including weeds. They are used for food, nesting, and escape cover. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the

surface layer, available water capacity, wetness, salinity, surface stoniness, soil reaction, ponding, and flooding. Soil temperature and soil moisture also are considerations. Examples of wild herbaceous plants are big bluestem, switchgrass, indiangrass, green needlegrass, and sideoats grama.

Planted woody plants include trees and shrubs that require cultivation before and during establishment and eventually will provide fruit, buds, twigs, bark, and foliage. These plants are important as food sources and provide reproductive cover, winter cover, and escape cover. Soil properties that affect the growth of trees and shrubs are depth of the root zone, available water capacity, soil reaction, wetness, slope, flooding, ponding, salinity, and soil moisture. Examples of these trees and shrubs are green ash, hackberry, caragana, plum, chokecherry, Rocky Mountain juniper, and eastern redcedar.

Native deciduous trees and woody understory produce nuts or other fruit, buds, twigs, bark, and foliage. Besides the food sources they provide, these elements are important for winter cover and escape cover. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, salinity, flooding, ponding, soil reaction, available water capacity, and wetness. Examples of these plants are elm, cottonwood, ash, bur oak, willow, plum, and chokecherry.

Native coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, salinity, flooding, ponding, soil reaction, and wetness. Eastern redcedar is the only species of this type that grows regularly in the survey area.

Native shrubs are bushy woody plants that produce fruit, buds, twigs, bark, and foliage. Soil properties and features that affect the growth of shrubs are depth of the root zone, available water capacity, salinity, soil reaction, flooding, ponding, wetness, and soil moisture. Examples of shrubs are gooseberry, snowberry, sumac, willows, and false indigo.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. They are important as food and provide reproductive cover. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are cattails, sloughgrass, whitetop, cordgrass, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet and include naturally wet areas. Shallow water areas can be created by dams, levees, or other water-control structures. Soil properties and features affecting development of shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

Information concerning the habitat elements needed to maintain and manage specific wildlife species can be obtained from the local office of the Natural Resources Conservation Service; the South Dakota Department of Game, Fish and Parks; the United States Fish and Wildlife Service; or the Wildlife and Fisheries Sciences Department at South Dakota State University.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. Ratings are given for building site development, sanitary facilities, construction materials, and water management. The ratings are based on observed performance of the soils and on the data in the tables described under the heading “Soil Properties.”

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kinds of adsorbed

cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, earthfill, and topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Table 12 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, and local roads and streets. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, or other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock or a very firm dense layer, stone content, soil texture, and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and depth to the water table.

Dwellings and *small commercial buildings* are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrinking and swelling, and organic layers can cause the movement of footings. A high water table, depth to bedrock, large stones, slope, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 60 to 80 inches are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or stabilized soil material; and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic-supporting capacity.

Sanitary Facilities

Table 13 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

The table also shows the suitability of the soils for use as daily cover for landfill. A rating of *good* indicates that soil properties and site features are

favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock, and flooding or ponding affect absorption of the effluent. Large stones and bedrock interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

The table gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock, flooding, ponding, large stones, and content of organic matter.

Excessive seepage resulting from rapid permeability in the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope and bedrock can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground-water pollution. Ease of excavation and revegetation should be considered.

The ratings in the table are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock, a high water table, slope, flooding, and ponding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, rock fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to wind erosion.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock or the water table to permit revegetation. The soil material used as the final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 14 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and

topsoil. They are rated as a *probable* or *improbable* source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 60 or 80 inches.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 60 or 80 inches. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help to determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, a low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have a moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones or have a water table at a depth of 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent; are wet; or have a water table at a depth of less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and *gravel* are natural aggregates suitable for commercial use with a minimum of processing. They are used in many kinds of construction. Specifications for each use vary widely. In table 14, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Reaction and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, salinity, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, flooding, ponding, bedrock, and toxic material.

Soils rated *good* have friable, loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, have a seasonal high water table at or near the surface, or are subject to frequent flooding or ponding.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and absorption of nutrients for plant growth.

Water Management

Table 15 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas and for embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and the potential for frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, and sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by the cropping system, depth to the water table, flooding, ponding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to control erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind erosion or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts and sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examination, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classification, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

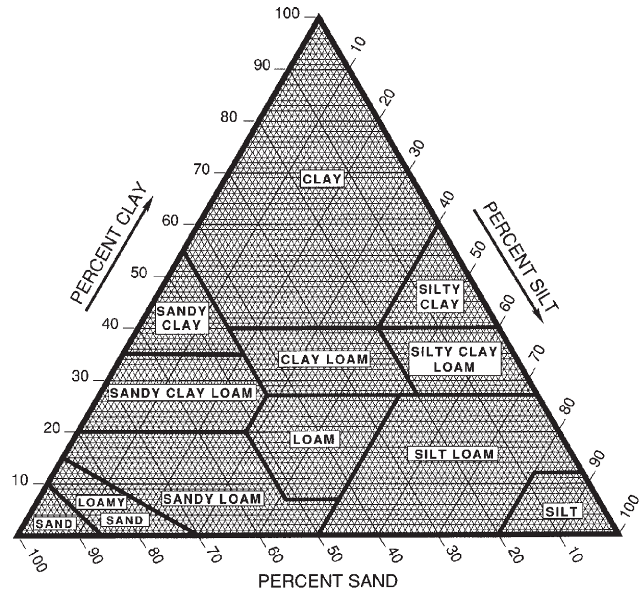

Figure 17.—Percentages of clay, silt, and sand in the basic USDA soil textural classes.

Engineering Index Properties

Table 16 gives the engineering classifications and the range of index properties for the layers of each soil in the survey area.

Depth to the upper and lower boundaries of each layer is indicated.

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter (fig. 17). "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is 15 percent or more, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (ASTM, 2001) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 2000).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to particle-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the

basis of particle-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of particle-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is generally omitted in the table.

Physical and Chemical Properties

Table 17 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In the table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at $^{1}/_{3}$-bar moisture tension. Weight is determined after the soil is dried at 105 degrees C. In table 17, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design and management of irrigation systems, the development of nutrient and pesticide management plans, and the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect retention of water and depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown, in the selection of a tillage system, in crop residue management decisions, and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops

and other plants, in selecting pesticides, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on the basis of measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; *high*, 6 to 9 percent; and *very high*, greater than 9 percent.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.02 to 0.64. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without reducing soil quality or crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion. The soils assigned to group 1 are the most susceptible to wind erosion, and those assigned to group 8 are the least susceptible. The groups are as follows:

1. Coarse sands, sands, fine sands, and very fine sands.

2. Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, ash material, and sapric soil material.

3. Coarse sandy loams, sandy loams, fine sandy loams, and very fine sandy loams.

4L. Calcareous loams, silt loams, clay loams, and silty clay loams.

4. Clays, silty clays, noncalcareous clay loams, and silty clay loams that are more than 35 percent clay.

5. Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material.

6. Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay.

7. Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material.

8. Soils that are not subject to wind erosion because of rock fragments on the surface or because of surface wetness.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 17, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and Water Features

Table 18 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low

runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to two hydrologic groups in the table, the first letter is for drained areas and the second is for undrained areas.

Flooding, the temporary inundation of an area, is caused by overflowing streams or by runoff from adjacent slopes. Water standing for short periods after rainfall or snowmelt is not considered flooding, and water standing in swamps and marshes is considered ponding rather than flooding.

The table gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions (the chance of flooding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs, on the average, once or less in 2 years (the chance of flooding is 5 to 50 percent in any year); and *frequent* that it occurs, on the average, more than once in 2 years (the chance of flooding is more than 50 percent in any year). Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, *long* if 7 days to 1 month, and *very long* if more than 1 month. Probable dates are expressed in months. About two-thirds to three-fourths of all flooding occurs during the stated period.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The estimates are based mainly on observations of the water table at selected sites and on the evidence of a saturated zone, namely grayish colors or mottles (redoximorphic features) in the soil. Indicated in the table are depth to the seasonal high water table, the kind of water table, and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in the table.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Two numbers in the column showing depth to the water table indicate the normal range in depth to a saturated zone. Depth is given to the nearest half foot. The first numeral in the range indicates the highest water level. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. “More than 6.0” indicates that the water table is below a depth of 6 feet or that it is within a depth of 6 feet for less than a month.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation

or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low, moderate,* or *high,* is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion also is expressed as *low, moderate,* or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (Soil Survey Staff, 1999). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 19 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Twelve soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Mollisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Aquoll (*Aqu*, meaning water, plus *oll*, from Mollisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; type of saturation; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Endoaquoll (*Endo*, referring to endosaturation, plus *aquoll*, the suborder of the Mollisols that has an aquic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic subgroup is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other taxonomic class. Each subgroup is identified by one or more adjectives preceding the name of the great group. An example is Cumulic Endoaquolls.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineralogy class, cation-exchange activity class, soil temperature regime, soil depth, and reaction class. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-silty, mixed, superactive, calcareous, mesic Cumulic Endoaquolls.

SERIES. The series consists of soils within a family that have horizons similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. Characteristics of the soil and the material in which it formed are identified for each series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the “Soil Survey Manual” (Soil Survey Division Staff, 1993). Many of the technical terms used in the descriptions are defined in “Soil Taxonomy” (Soil Survey Staff, 1999) and in “Keys to Soil Taxonomy” (Soil Survey Staff, 1998). Unless otherwise indicated, matrix colors in the descriptions are for dry soil; redoximorphic concentrations, redoximorphic depletions, mottles (the term used for color patterns not related to soil wetness), organic coats, and stains are described under moist conditions. No wet consistence is given when the soil material is nonsticky or nonplastic. Following the pedon description is the range of important characteristics of the soils in the series.

Alcester Series

Depth to bedrock: Very deep
Drainage class: Well drained and moderately well drained

Permeability: Moderate
Landform: Fans and flood plains
Parent material: Silty colluvial-alluvial sediments and silty alluvium
Slope: 0 to 6 percent

Typical Pedon

Alcester silty clay loam (fig. 18), 0 to 2 percent slopes, 55 feet south and 700 feet west of the northeast corner of sec. 12, T. 103 N., R. 50 W.; USGS Crooks, SD, topographic quadrangle; lat. 43 degrees 44 minutes 47 seconds N. and long. 96 degrees 46 minutes 25 seconds W.

Ap—0 to 8 inches; dark gray (10YR 4/1) silty clay loam, very dark gray (10YR 3/1) moist; weak fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; few very fine and fine roots throughout; slightly acid; abrupt smooth boundary.
A—8 to 16 inches; dark gray (10YR 4/1) silty clay loam, very dark gray (10YR 3/1) moist; weak medium subangular blocky structure parting to weak fine granular; slightly hard, friable, slightly sticky and slightly plastic; few very fine and fine roots throughout; few very fine and fine tubular pores; slightly acid; clear wavy boundary.
Bw1—16 to 29 inches; dark gray (10YR 4/1) silty clay loam, very dark gray (10YR 3/1) moist; weak medium prismatic structure parting to weak medium subangular blocky; hard, friable, slightly sticky and slightly plastic; few very fine and fine roots throughout; few very fine and fine tubular pores; slightly acid; gradual wavy boundary.
Bw2—29 to 36 inches; dark gray (10YR 4/1) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to weak medium subangular blocky; hard, friable, slightly sticky and slightly plastic; few very fine tubular pores; neutral; gradual wavy boundary.
Bw3—36 to 42 inches; grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to weak medium subangular blocky; hard, friable, slightly sticky and slightly plastic; few very fine tubular pores; neutral; gradual wavy boundary.
Bw4—42 to 50 inches; grayish brown (10YR 5/2) silty clay loam, dark brown (10YR 3/3) moist; weak coarse prismatic structure parting to weak medium and coarse subangular blocky; hard, friable, slightly sticky and slightly plastic; few very fine tubular pores; neutral; clear wavy boundary.
Bw5—50 to 60 inches; light olive brown (2.5Y 5/3) silty clay loam, olive brown (2.5Y 4/3) moist; weak coarse prismatic structure parting to weak medium and coarse subangular blocky; hard, friable, slightly sticky and slightly plastic; few very fine and fine tubular pores; neutral; gradual wavy boundary.
Bw6—60 to 80 inches; light olive brown (2.5Y 5/3) silty clay loam, olive brown (2.5Y 4/3) moist; weak coarse subangular blocky structure parting to weak medium and coarse subangular blocky; hard, friable, slightly sticky and slightly plastic; few very fine tubular pores; very slightly effervescent; neutral.

Range in Characteristics

Thickness of the mollic epipedon: 24 to 60 inches
Depth to carbonates: More than 36 inches
Depth to contrasting parent material: More than 40 inches over clayey alluvium
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches
Other features: Some pedons have a Bk horizon and a C horizon.

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1 or 2
Texture—silty clay loam or silt loam

Bw horizon:
Hue—10YR or 2.5Y
Value—3 to 5 (2 to 4 moist)
Chroma—1 to 3
Texture—silt loam or silty clay loam

Arlo Series

Depth to bedrock: Very deep
Drainage class: Poorly drained
Permeability: Moderate in the loamy sediments and very rapid in the underlying gravelly material
Landform: Flood plains
Parent material: Loamy alluvium over glacial outwash
Slope: 0 to 1 percent

Typical Pedon

Arlo loam (fig. 19), 0 to 1 percent slopes, 2,600 feet north and 790 feet west of the southeast corner of sec. 7, T. 103 N., R. 50 W.; USGS Crooks, SD, topographic quadrangle; lat. 43 degrees 44 minutes 20 seconds N. and long. 96 degrees 52 minutes 26 seconds W.

Ap—0 to 10 inches; very dark gray (10YR 3/1) loam, black (10YR 2/1) moist; weak fine subangular blocky structure parting to weak fine granular; hard, friable, slightly sticky and slightly plastic; few

very fine and fine roots throughout; few very fine vesicular and tubular pores; 6 percent calcium carbonate equivalent; slightly effervescent; slightly alkaline; abrupt smooth boundary.

Bkg1—10 to 14 inches; dark grayish brown (2.5Y 4/2) loam, very dark grayish brown (2.5Y 3/2) moist; weak fine and medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine and fine roots throughout; common very fine tubular pores; 8 percent calcium carbonate equivalent; few faint discontinuous black (10YR 2/1) organic coats on faces of peds; few fine cylindrical soft masses of carbonate; few fine distinct dark yellowish brown (10YR 4/4) redoximorphic concentrations; strongly effervescent; slightly alkaline; clear wavy boundary.

Bkg2—14 to 20 inches; grayish brown (2.5Y 5/2) loam, very dark grayish brown (2.5Y 3/2) moist; weak medium and coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine and fine roots throughout; common very fine and fine tubular pores; 15 percent calcium carbonate equivalent; common fine and medium irregular soft masses of carbonate; few fine prominent dark yellowish brown (10YR 4/6) redoximorphic concentrations; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bkg3—20 to 30 inches; grayish brown (2.5Y 5/2) loam, dark grayish brown (2.5Y 4/2) moist; weak medium and coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine roots throughout; common very fine tubular pores; 10 percent calcium carbonate equivalent; common fine and medium irregular soft masses of carbonate and common fine rounded soft masses of iron-manganese; 2 percent subrounded mixed gravel; strongly effervescent; moderately alkaline; clear wavy boundary.

2Cg—30 to 80 inches; light olive brown (2.5Y 5/4) gravelly sand, olive brown (2.5Y 4/4) moist; single grain; loose; 6 percent calcium carbonate equivalent; discontinuous carbonate coats on rock fragments and few prominent patchy dark yellowish brown (10YR 4/6) iron stains on rock fragments; 15 percent subrounded mixed gravel; common fine distinct dark grayish brown (2.5Y 4/2) redoximorphic depletions; slightly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 30 inches
Depth to carbonates: 0 to 6 inches
Depth to contrasting parent material: 20 to 40 inches over gravelly material
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches
Other features: Some pedons have an Ak horizon, a C horizon, or both.

A horizon:
Hue—10YR or 2.5Y
Value—3 to 5 (2 or 3 moist)
Chroma—1
Texture—loam, clay loam, or silty clay loam

Bkg horizon:
Hue—10YR, 2.5Y, or 5Y
Value—5 or 6 (3 to 5 moist)
Chroma—1 or 2
Texture—dominantly loam, sandy clay loam, or clay loam; sandy loam or gravelly clay loam in some pedons

2Cg horizon:
Hue—10YR, 2.5Y, or 5Y
Value—5 to 7 (4 to 6 moist)
Chroma—1 to 4
Texture—gravelly sand, gravelly loamy sand, very gravelly sand, sand, or loamy sand

Baltic Series

Depth to bedrock: Very deep
Drainage class: Very poorly drained
Permeability: Slow
Landform: Till plains and flood plains
Parent material: Clayey alluvium
Slope: 0 to 1 percent

Typical Pedon

Baltic silty clay loam, 0 to 1 percent slopes, 125 feet south and 2,265 feet east of the northwest corner of sec. 27, T. 104 N., R. 51 W.; USGS Colton, SD, topographic quadrangle; lat. 43 degrees 47 minutes 24 seconds N. and long. 96 degrees 56 minutes 31 seconds W.

A1—0 to 7 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; weak fine granular structure; hard, friable, slightly sticky and slightly plastic; few very fine roots throughout; 9 percent calcium carbonate equivalent; strongly effervescent; slightly alkaline; clear wavy boundary.

A2—7 to 12 inches; very dark gray (10YR 3/1) silty clay, black (10YR 2/1) moist; weak medium and coarse subangular blocky structure; hard, friable,

slightly sticky and slightly plastic; few very fine roots throughout; few very fine tubular pores; 9 percent calcium carbonate equivalent; few fine prominent brown (7.5YR 4/3) redoximorphic concentrations; strongly effervescent; slightly alkaline; clear wavy boundary.

Bw1—12 to 26 inches; very dark gray (2.5Y 3/1) silty clay, black (2.5Y 2/1) moist; weak medium and coarse subangular blocky structure; hard, friable, sticky and plastic; few very fine and fine roots throughout; few very fine tubular pores; 7 percent calcium carbonate equivalent; strongly effervescent; few fine prominent dark yellowish brown (10YR 4/4) redoximorphic concentrations; slightly alkaline; gradual wavy boundary.

Bw2—26 to 38 inches; dark gray (2.5Y 4/1) silty clay loam, very dark gray (2.5Y 3/1) moist; weak coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine and fine roots throughout; few very fine tubular pores; 7 percent calcium carbonate equivalent; few fine irregular masses of gypsum; few fine prominent dark yellowish brown (10YR 4/4) redoximorphic concentrations; slightly effervescent; slightly alkaline; gradual wavy boundary.

Bg—38 to 55 inches; gray (5Y 6/1) silty clay loam, dark gray (5Y 4/1) moist; weak coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few fine roots throughout; few very fine tubular pores; 4 percent calcium carbonate equivalent; few fine irregular black (10YR 2/1) soft masses of iron-manganese and few fine gypsum crystals; common fine and medium prominent yellowish brown (10YR 5/6) and brownish yellow (10YR 6/8) redoximorphic concentrations and common fine and medium faint gray (2.5Y 5/1) redoximorphic depletions; slightly effervescent; slightly alkaline; gradual wavy boundary.

Cg—55 to 80 inches; light gray (5Y 7/1) silty clay loam, gray (5Y 6/1) moist; massive; hard, firm, slightly sticky and slightly plastic; 7 percent calcium carbonate equivalent; few fine cylindrical soft masses of carbonate, few fine irregular black (10YR 2/1) soft masses of iron-manganese, and few fine gypsum crystals; common fine prominent strong brown (7.5YR 5/8) and common fine and medium prominent yellowish brown (10YR 5/6) redoximorphic concentrations and common fine and medium faint gray (2.5Y 5/1) redoximorphic depletions; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 24 to 60 inches
Carbonates: At the surface
Depth to contrasting parent material: More than 60 inches
Depth to gypsum and other visible salts (other than carbonates): 20 to 55 inches
Other features: Some pedons have a Bk horizon, a By horizon, or both.

A horizon:
Hue—10YR, 2.5Y, 5Y, or N
Value—3 to 5 (2 or 3 moist)
Chroma—0 or 1
Texture—silty clay loam or silty clay

Bw and Bg horizons:
Hue—10YR, 2.5Y, 5Y, or N
Value—3 to 5 (2 to 4 moist)
Chroma—0 to 3
Texture—silty clay, silty clay loam, or clay

Cg horizon:
Hue—10YR, 2.5Y, 5Y, or N
Value—4 to 7 (2 to 6 moist)
Chroma—0 or 1
Texture—silty clay loam, silty clay, or clay loam

Benclare Series

Depth to bedrock: Very deep
Drainage class: Moderately well drained
Permeability: Slow
Landform: Terraces
Parent material: Clayey lacustrine sediments
Slope: 0 to 2 percent

Typical Pedon

Benclare silty clay loam, in an area of Benclare-Corson complex, 0 to 2 percent slopes, 110 feet north and 515 feet east of the southwest corner of sec. 6, T. 101 N., R. 47 W.; USGS Brandon, SD-IA, topographic quadrangle; lat. 43 degrees 34 minutes 24 seconds N. and long. 96 degrees 31 minutes 48 seconds W.

Ap—0 to 8 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; weak medium subangular blocky structure parting to moderate fine granular; hard, friable, slightly sticky and slightly plastic; common very fine roots throughout; common very fine vesicular pores; moderately acid; abrupt smooth boundary.

Bw1—8 to 15 inches; dark gray (10YR 4/1) silty clay, black (10YR 2/1) moist; weak medium and coarse prismatic structure parting to moderate fine subangular blocky; hard, firm, sticky and plastic; common very fine roots throughout; common very

fine tubular pores; very few patchy pressure faces; few wormcasts; slightly acid; gradual wavy boundary.

Bw2—15 to 24 inches; grayish brown (10YR 5/2) and dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) and very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure parting to strong very fine and fine subangular blocky; hard, firm, sticky and plastic; common very fine roots throughout; common fine tubular pores; very few patchy pressure faces; few wormcasts; slightly acid; gradual wavy boundary.

Bw3—24 to 31 inches; grayish brown (2.5Y 5/2) silty clay, very dark grayish brown (2.5Y 3/2) moist; moderate medium prismatic structure parting to strong fine and medium subangular blocky; very hard, very firm, sticky and plastic; common very fine tubular pores; very few discontinuous pressure faces; neutral; clear wavy boundary.

Bk1—31 to 42 inches; light brownish gray (2.5Y 6/2) silty clay, grayish brown (2.5Y 5/2) moist; weak medium and coarse prismatic structure parting to moderate fine and medium subangular blocky; very hard, very firm, sticky and plastic; common very fine tubular pores; few fine distinct very dark gray (5Y 3/1) coats; 7 percent calcium carbonate equivalent; common fine and medium rounded soft masses of carbonate; strongly effervescent; slightly alkaline; gradual wavy boundary.

Bk2—42 to 52 inches; pale olive (5Y 6/3) clay, olive (5Y 5/3) moist; moderate coarse subangular blocky structure parting to moderate medium subangular blocky; very hard, very firm, sticky and plastic; common very fine tubular pores; 15 percent calcium carbonate equivalent; very few discontinuous pressure faces; common medium rounded soft masses of carbonate; common fine prominent light olive brown (2.5Y 5/6) redoximorphic concentrations and common fine distinct dark gray (5Y 4/1) redoximorphic depletions; violently effervescent; moderately alkaline; gradual wavy boundary.

C—52 to 80 inches; pale yellow (5Y 7/3) clay, pale olive (5Y 6/3) moist; massive; very hard, very firm, sticky and plastic; common very fine tubular pores; 20 percent calcium carbonate equivalent; many fine and medium distinct gray (5Y 5/1) redoximorphic depletions; violently effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 20 to 50 inches
Depth to carbonates: More than 60 inches
Depth to contrasting parent material: More than 60 inches
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches

Ap horizon:
Hue—10YR
Value—2 to 4 (2 or 3 moist)
Chroma—1
Texture—silty clay loam or silty clay

Bw horizon:
Hue—10YR or 2.5Y
Value—3 to 5 (2 to 4 moist)
Chroma—1 to 3
Texture—silty clay or silty clay loam

Bk horizon:
Hue—2.5Y or 5Y
Value—5 to 7 (4 to 6 moist)
Chroma—1 to 3
Texture—silty clay, silty clay loam, or clay

C horizon:
Hue—2.5Y or 5Y
Value—5 to 7 (4 to 6 moist)
Chroma—1 to 3
Texture—silty clay, silty clay loam, or clay; stratified fine sandy loam or fine sand below a depth of 40 inches in some pedons

Betts Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderately slow
Landform: Moraines
Parent material: Loamy glacial till
Slope: 9 to 40 percent

Typical Pedon

Betts loam, in an area of Ethan-Betts loams, 9 to 15 percent slopes, 2,150 feet south and 140 feet west of the northeast corner of sec. 12, T. 101 N., R. 51 W.; USGS Hartford, SD, topographic quadrangle; lat. 43 degrees 34 minutes 00 seconds N. and long. 96 degrees 53 minutes 26 seconds W.

A—0 to 5 inches; dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; weak fine granular structure; hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; few very fine tubular pores; 8 percent calcium carbonate equivalent; 2 percent subangular and subrounded mixed gravel; strongly effervescent; slightly alkaline; clear wavy boundary.

Bk1—5 to 11 inches; light yellowish brown (2.5Y 6/3) clay loam, olive brown (2.5Y 4/3) moist; weak coarse prismatic structure parting to weak medium and coarse subangular blocky; hard, firm, slightly sticky and slightly plastic; common very fine and fine roots; few very fine and fine tubular pores; 13 percent calcium carbonate equivalent; common fine rounded soft masses of carbonate and common medium very dark brown (10YR 2/2) wormcasts; 2 percent subangular and subrounded mixed gravel; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk2—11 to 26 inches; light yellowish brown (2.5Y 6/3) clay loam, olive brown (2.5Y 4/4) moist; weak medium and coarse subangular blocky structure; hard, firm, slightly sticky and slightly plastic; common very fine and fine roots; few very fine and fine tubular pores; 10 percent calcium carbonate equivalent; common fine and medium rounded soft masses of carbonate; 2 percent subangular and subrounded mixed gravel; strongly effervescent; moderately alkaline; gradual wavy boundary.

C1—26 to 35 inches; light yellowish brown (2.5Y 6/3) clay loam, light olive brown (2.5Y 5/4) moist; massive; hard, firm, slightly sticky and slightly plastic; common very fine and fine roots; few very fine tubular pores; 10 percent calcium carbonate equivalent; few fine and medium rounded soft masses of carbonate; 2 percent subangular and subrounded mixed gravel; common fine prominent yellowish brown (10YR 5/8) and light gray (2.5Y 7/1) relict redoximorphic features; strongly effervescent; moderately alkaline; gradual wavy boundary.

C2—35 to 80 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; massive; hard, firm, slightly sticky and slightly plastic; 8 percent calcium carbonate equivalent; few fine and medium rounded black (10YR 2/1) soft masses of iron-manganese; 2 percent subangular and subrounded mixed gravel; many fine and medium prominent yellowish brown (10YR 5/8) and many fine and medium prominent light gray (2.5Y 7/1) relict redoximorphic features; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: 0 to 3 inches
Depth to contrasting parent material: More than 60 inches
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches
Other features: Some pedons have a BCk horizon.

A horizon:
Hue—10YR
Value—3 to 6 (2 to 5 moist)
Chroma—1 to 3
Texture—loam or clay loam

Bk horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—clay loam

C horizon:
Hue—2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—clay loam or loam

Blendon Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderately rapid in the fine sandy loam material and moderately slow in the underlying clay loam
Landform: Outwash plains
Parent material: Loamy glaciofluvial sediments
Slope: 0 to 6 percent

Typical Pedon

Blendon fine sandy loam, 0 to 2 percent slopes, 150 feet north and 850 feet east of the southwest corner of sec. 34, T. 103 N., R. 49 W.; USGS Renner, SD, topographic quadrangle; lat. 43 degrees 40 minutes 29 seconds N. and long. 96 degrees 42 minutes 28 seconds W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) fine sandy loam, black (10YR 2/1) moist; weak fine granular structure; soft, very friable; common very fine and fine roots throughout; common medium tubular pores; few krotovinas; moderately acid; abrupt smooth boundary.

A—7 to 12 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable; common very fine roots throughout; common very fine and fine tubular pores; few krotovinas; moderately acid; clear smooth boundary.

Bw—12 to 28 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to weak fine granular; soft, very friable; few

very fine roots throughout; common very fine and fine tubular pores; slightly acid; clear smooth boundary.

C1—28 to 43 inches; grayish brown (10YR 5/2) loamy fine sand, dark grayish brown (10YR 4/2) moist; single grain; loose; few very fine roots throughout; neutral; clear smooth boundary.

C2—43 to 54 inches; grayish brown (10YR 5/2) loamy fine sand, very dark grayish brown (10YR 3/2) moist; single grain; loose; few very fine roots throughout; neutral; clear smooth boundary.

C3—54 to 74 inches; light olive brown (2.5Y 5/4) fine sand, olive brown (2.5Y 4/4) moist; single grain; loose; few very fine roots throughout; neutral; abrupt smooth boundary.

2C4—74 to 80 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; massive; hard, friable, slightly sticky and slightly plastic; few very fine roots throughout; common very fine and fine tubular pores; slightly acid.

Range in Characteristics

Thickness of the mollic epipedon: 20 to 36 inches
Depth to carbonates: More than 40 inches
Depth to contrasting parent material: More than 40 inches over loamy material
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches
Other features: Some pedons do not have a 2C horizon.

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1 or 2
Texture—fine sandy loam, loam, or sandy loam

Bw horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1 to 3
Texture—fine sandy loam, sandy loam, or loam

C horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (3 to 5 moist)
Chroma—2 to 4
Texture—typically loamy fine sand or loamy sand; sandy loam, fine sandy loam, gravelly sandy loam, gravelly fine sandy loam, sand, or fine sand in some pedons

2C horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (3 to 5 moist)
Chroma—2 to 4
Texture—clay loam or loam

Bon Series

Depth to bedrock: Very deep
Drainage class: Moderately well drained
Permeability: Moderate
Landform: Flood plains
Parent material: Loamy alluvium
Slope: 0 to 2 percent

Typical Pedon

Bon loam, 0 to 2 percent slopes, 2,450 feet south and 2,590 feet west of the northeast corner of sec. 11, T. 104 N., R. 49 W.; USGS Dell Rapids, SD, topographic quadrangle; lat. 43 degrees 49 minutes 35 seconds N. and long. 96 degrees 40 minutes 36 seconds W.

Ap—0 to 9 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; weak fine granular structure; hard, friable, slightly sticky and slightly plastic; few fine roots throughout; few very fine vesicular and tubular pores; 7 percent calcium carbonate equivalent; slightly effervescent; slightly alkaline; abrupt smooth boundary.

Bw1—9 to 23 inches; dark gray (10YR 4/1) loam, very dark gray (10YR 3/1) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine and fine roots throughout; few very fine and fine tubular pores; 8 percent calcium carbonate equivalent; strongly effervescent; slightly alkaline; gradual wavy boundary.

Bw2—23 to 39 inches; dark gray (10YR 4/1) loam, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure parting to weak medium subangular blocky; hard, friable, slightly sticky and slightly plastic; few very fine roots throughout; few very fine and fine tubular pores; 8 percent calcium carbonate equivalent; strongly effervescent; slightly alkaline; clear smooth boundary.

C1—39 to 45 inches; dark gray (10YR 4/1) loam and stratified loamy fine sand, very dark gray (10YR 3/1) moist; massive; hard, friable, slightly sticky and slightly plastic; few fine tubular pores; 8 percent calcium carbonate equivalent; strongly effervescent; moderately alkaline; clear smooth boundary.

C2—45 to 65 inches; dark grayish brown (10YR 4/2) loam and stratified loamy fine sand, very dark grayish brown (10YR 3/2) moist; massive; hard,

friable, slightly sticky and slightly plastic; few very fine and fine tubular pores; 7 percent calcium carbonate equivalent; strongly effervescent; moderately alkaline; clear wavy boundary.

C3—65 to 74 inches; dark grayish brown (10YR 4/2) loam and stratified loamy fine sand, very dark grayish brown (10YR 3/2) moist; massive; hard, friable, slightly sticky and slightly plastic; few very fine and fine tubular pores; 8 percent calcium carbonate equivalent; few fine rounded soft masses of carbonate; common fine prominent strong brown (7.5YR 5/6) redoximorphic concentrations; strongly effervescent; moderately alkaline; abrupt wavy boundary.

C4—74 to 78 inches; grayish brown (10YR 5/2) loamy fine sand and stratified fine sandy loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, very friable; few very fine and fine tubular pores; 8 percent calcium carbonate equivalent; common fine prominent strong brown (7.5YR 5/6) redoximorphic concentrations; strongly effervescent; moderately alkaline; abrupt wavy boundary.

C5—78 to 80 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; massive; hard, friable, slightly sticky and slightly plastic; few very fine and fine tubular pores; 7 percent calcium carbonate equivalent; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: More than 20 inches
Depth to carbonates: 0 to 20 inches
Depth to contrasting parent material: More than 60 inches
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches
Other features: Some pedons have a Bk horizon.

A horizon:
Hue—10YR
Value—3 to 5 (2 or 3 moist)
Chroma—1 or 2
Texture—loam, silt loam, or very fine sandy loam

Bw horizon:
Hue—10YR
Value—3 to 5 (2 or 3 moist)
Chroma—1 to 3
Texture—loam, silt loam, or very fine sandy loam

C horizon:
Hue—10YR or 2.5Y
Value—3 to 6 (2 to 4 moist)
Chroma—1 to 3
Texture—loam or fine sandy loam stratified with loamy fine sand; stratified silt loam, silty clay loam, or clay loam in some pedons

Bonilla Series

Depth to bedrock: Very deep
Drainage class: Moderately well drained
Permeability: Moderate
Landform: Till plains
Parent material: Loamy eolian material
Slope: 0 to 2 percent

Typical Pedon

Bonilla loam, in an area of Grovena-Bonilla loams, 0 to 2 percent slopes, 680 feet north and 100 feet east of the southwest corner of sec. 9, T. 104 N., R. 47 W.; USGS Jasper, MN/SD, topographic quadrangle; lat. 43 degrees 49 minutes 21 seconds N. and long. 96 degrees 29 minutes 32 seconds W.

Ap—0 to 11 inches; dark gray (10YR 4/1) loam, very dark gray (10YR 3/1) moist; moderate medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots throughout; common very fine vesicular and tubular pores; slightly acid; abrupt smooth boundary.

Bw1—11 to 22 inches; dark gray (10YR 4/1) clay loam, very dark gray (10YR 3/1) moist; moderate medium subangular blocky structure parting to weak fine granular; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots throughout; common very fine vesicular and tubular pores; neutral; clear smooth boundary.

Bw2—22 to 32 inches; light olive brown (2.5Y 5/3) clay loam, olive brown (2.5Y 4/3) moist; weak medium prismatic structure parting to weak fine subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots throughout; common very fine tubular pores; neutral; clear smooth boundary.

Bk—32 to 45 inches; light yellowish brown (2.5Y 6/3) clay loam, light olive brown (2.5Y 5/3) moist; moderate medium prismatic structure parting to weak fine subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots throughout; common very fine tubular pores; 14 percent calcium carbonate equivalent; common fine rounded soft masses of carbonate; few fine prominent light gray (10YR 7/1) redoximorphic depletions; strongly effervescent; moderately alkaline; gradual smooth boundary.

C—45 to 80 inches; light yellowish brown (2.5Y 6/3),

stratified silt loam, light olive brown (2.5Y 5/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common very fine tubular pores; 12 percent calcium carbonate equivalent; common fine prominent light gray (10YR 7/1) redoximorphic depletions; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 20 to 40 inches
Depth to carbonates: 20 to 40 inches
Depth to contrasting parent material: More than 60 inches
Depth to gypsum and other visible salts (other than carbonates): 50 to more than 60 inches

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1 or 2
Texture—loam, fine sandy loam, or silt loam

Bw horizon:
Hue—10YR or 2.5Y
Value—4 to 6 (2 to 4 moist)
Chroma—1 to 3
Texture—loam or clay loam

Bk horizon:
Hue—10YR or 2.5Y
Value—6 or 7 (4 or 5 moist)
Chroma—1 to 3
Texture—loam, clay loam, silt loam, or silty clay loam

C horizon:
Hue—10YR or 2.5Y
Value—6 or 7 (4 or 5 moist)
Chroma—1 to 4
Texture—stratified silt loam, loam, or clay loam; stratified fine sandy loam, silty clay loam, or loamy sand in some pedons

Chancellor Series

Depth to bedrock: Very deep
Drainage class: Somewhat poorly drained
Permeability: Slow
Landform: Till plains and plains
Parent material: Local silty and clayey alluvium
Slope: 0 to 1 percent

Typical Pedon

Chancellor silty clay loam, 0 to 1 percent slopes, 200 feet south and 2,100 feet west of the northeast corner of sec. 22, T. 104 N., R. 48 W.; USGS Dell Rapids Southeast, SD, topographic quadrangle; lat. 43 degrees 48 minutes 13 seconds N. and long. 96 degrees 34 minutes 45 seconds W.

Ap—0 to 12 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine roots throughout; few fine vesicular and tubular pores; slightly acid; clear smooth boundary.

Bt1—12 to 17 inches; very dark gray (2.5Y 3/1) silty clay, black (2.5Y 2/1) moist; moderate medium prismatic structure parting to weak fine subangular blocky; slightly hard, friable, sticky and plastic; few fine roots throughout; few very fine tubular pores; few discontinuous clay films on faces of peds; slightly acid; clear smooth boundary.

Bt2—17 to 23 inches; dark gray (2.5Y 4/1) silty clay, very dark gray (2.5Y 3/1) moist; moderate fine prismatic structure parting to moderate fine subangular blocky; slightly hard, friable, sticky and plastic; few fine roots throughout; few very fine tubular pores; common continuous clay films on faces of peds and very few carbonate coats in root channels and pores; slightly acid; clear smooth boundary.

Bt3—23 to 31 inches; dark gray (2.5Y 4/1) silty clay, very dark gray (2.5Y 3/1) moist; moderate medium prismatic structure parting to weak coarse subangular blocky; slightly hard, friable, sticky and plastic; few very fine tubular pores; few discontinuous clay films on faces of peds; common fine distinct light yellowish brown (10YR 6/4) redoximorphic concentrations; neutral; clear smooth boundary.

Bk—31 to 47 inches; gray (2.5Y 6/1) silty clay loam, grayish brown (2.5Y 5/2) moist; weak coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; 6 percent calcium carbonate equivalent; few fine rounded soft masses of carbonate; common fine distinct pale brown (10YR 6/3) redoximorphic concentrations: very slightly effervescent; slightly alkaline; gradual smooth boundary.

C—47 to 80 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; 3 percent calcium carbonate equivalent; common fine rounded iron-manganese concretions; common fine distinct pale brown (10YR 6/3) redoximorphic concentrations: very slightly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 24 to 40 inches
Depth to carbonates: 28 to 50 inches
Depth to contrasting parent material: More than 60 inches
Depth to gypsum and other visible salts (other than carbonates): More than 20 inches

A horizon:
Hue—10YR or 2.5Y
Value—3 or 4 (2 or 3 moist)
Chroma—1
Texture—silty clay loam or silty clay

Bt horizon:
Hue—10YR, 2.5Y, or 5Y
Value—3 to 6 (2 to 4 moist)
Chroma—1 or 2
Texture—silty clay or silty clay loam

Bk horizon:
Hue—2.5Y or 5Y
Value—4 to 7 (3 to 6 moist)
Chroma—1 to 4
Texture—silty clay loam or silt loam

C horizon:
Hue—2.5Y or 5Y
Value—5 to 7 (4 to 6 moist)
Chroma—1 to 4
Texture—silty clay loam, clay loam, or loam

Chaska Series

Depth to bedrock: Very deep
Drainage class: Somewhat poorly drained
Permeability: Moderate
Landform: Flood plains
Parent material: Loamy alluvium
Slope: 0 to 2 percent

Typical Pedon

Chaska loam, channeled, 300 feet south and 2,500 feet west of the northeast corner of sec. 8, T. 102 N., R. 49 W.; USGS Renner, SD, topographic quadrangle; lat. 43 degrees 39 minutes 33 seconds N. and long. 96 degrees 44 minutes 16 seconds W.

A—0 to 6 inches; dark grayish brown (10YR 4/2), stratified loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable, slightly sticky; common very fine and fine roots throughout; few very fine tubular pores; 7 percent calcium carbonate equivalent; strongly effervescent; slightly alkaline; abrupt smooth boundary.

C1—6 to 17 inches; gray (10YR 5/1) loam, very dark brown (10YR 2/2) moist, and light gray (10YR 7/2), stratified loamy fine sand, grayish brown (10YR 5/2) moist; massive; soft, very friable; common very fine roots throughout; few very fine tubular pores; 7 percent calcium carbonate equivalent; slightly effervescent; slightly alkaline; abrupt smooth boundary.

C2—17 to 60 inches; dark gray (2.5Y 4/1), stratified loam, very dark gray (2.5Y 3/1) moist; massive; soft, very friable, slightly sticky and slightly plastic; common very fine roots throughout; few very fine tubular pores; few snail-shell fragments; 7 percent calcium carbonate equivalent; slightly effervescent; moderately alkaline; clear smooth boundary.

C3—60 to 72 inches; dark gray (2.5Y 4/1) loam, very dark gray (2.5Y 3/1) moist, and light brownish gray (2.5Y 6/2), stratified loamy fine sand, grayish brown (2.5Y 5/2) moist; massive; soft, very friable, slightly sticky; few very fine roots throughout; few very fine tubular pores; few snail-shell fragments; 7 percent calcium carbonate equivalent; slightly effervescent; slightly alkaline; clear smooth boundary.

C4—72 to 80 inches; dark gray (2.5Y 4/1) loam, very dark gray (2.5Y 3/1) moist, and light brownish gray (2.5Y 6/2), stratified loamy fine sand, grayish brown (2.5Y 5/2) moist; massive; soft, very friable, slightly sticky; few very fine tubular pores; few snail-shell fragments; 6 percent calcium carbonate equivalent; common fine prominent brown (10YR 5/3) redoximorphic concentrations; slightly effervescent; slightly alkaline.

Range in Characteristics

Depth to carbonates: 0 to 10 inches
Depth to contrasting parent material: More than 60 inches
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1 or 2
Texture—loam, silt loam, or clay loam

C horizon:
Hue—10YR or 2.5Y
Value—3 to 7 (2 to 5 moist)

Chroma—1 to 3
Texture—stratified loam, fine sandy loam, silt loam, very fine sandy loam, or loamy fine sand; stratified fine sand, sandy clay loam, silty clay loam, or clay loam in some pedons

Clamo Series

Depth to bedrock: Very deep
Drainage class: Poorly drained
Permeability: Slow
Landform: Flood plains
Parent material: Clayey alluvium
Slope: 0 to 1 percent

Typical Pedon

Clamo silty clay (fig. 20), 0 to 1 percent slopes, 68 feet north and 2,340 feet east of the southwest corner of sec. 6, T. 103 N., R. 49 W.; USGS Crooks, SD, topographic quadrangle; lat. 43 degrees 44 minutes 49 seconds N. and long. 96 degrees 45 minutes 45 seconds W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) silty clay, black (10YR 2/1) moist; weak fine granular structure; very hard, firm, very sticky and very plastic; common very fine and fine roots throughout; slightly acid; abrupt smooth boundary.
Bg1—8 to 15 inches; very dark gray (2.5Y 3/1) silty clay, black (2.5Y 2/1) moist; weak medium prismatic structure parting to moderate medium and coarse subangular blocky; very hard, firm, very sticky and very plastic; common very fine and fine roots throughout; few discontinuous pressure faces; slightly acid; clear wavy boundary.
Bg2—15 to 19 inches; very dark gray (2.5Y 3/1) silty clay, black (2.5Y 2/1) moist; weak medium prismatic structure parting to moderate medium and coarse subangular blocky; very hard, firm, very sticky and very plastic; few very fine and fine roots throughout; few very fine tubular pores; 8 percent calcium carbonate equivalent; few discontinuous pressure faces; few fine irregular soft masses of carbonate; slightly alkaline; clear wavy boundary.
Bg3—19 to 25 inches; dark gray (2.5Y 4/1) silty clay, black (2.5Y 2/1) moist; weak medium prismatic structure parting to moderate medium and coarse subangular blocky; very hard, firm, very sticky and very plastic; few very fine and fine roots throughout; few very fine tubular pores; 11 percent calcium carbonate equivalent; few discontinuous pressure faces; common fine and medium irregular soft masses of carbonate; slightly alkaline; clear wavy boundary.
Bkg1—25 to 46 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; weak coarse subangular blocky structure; very hard, firm, very sticky and very plastic; few very fine tubular pores; 15 percent calcium carbonate equivalent; few discontinuous pressure faces; common medium and coarse irregular soft masses of carbonate; common fine prominent strong brown (7.5YR 5/6) redoximorphic concentrations; strongly effervescent; slightly alkaline; clear wavy boundary.
Bkg2—46 to 51 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; weak coarse subangular blocky structure; very hard, firm, very sticky and very plastic; 11 percent calcium carbonate equivalent; few discontinuous pressure faces; common fine and medium irregular soft masses of carbonate and few fine irregular soft masses of iron-manganese; common fine prominent strong brown (7.5YR 5/6) redoximorphic concentrations; strongly effervescent; slightly alkaline; clear wavy boundary.
Bkg3—51 to 60 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak coarse subangular blocky structure; very hard, firm, slightly sticky and slightly plastic; 15 percent calcium carbonate equivalent; common fine and medium irregular soft masses of carbonate and few fine irregular soft masses of iron-manganese; common fine prominent strong brown (7.5YR 5/6) redoximorphic concentrations; strongly effervescent; moderately alkaline; clear wavy boundary.
Cg—60 to 80 inches; grayish brown (2.5Y 5/2) silty clay loam, very dark grayish brown (2.5Y 3/2) moist; massive; very hard, firm, slightly sticky and slightly plastic; 10 percent calcium carbonate equivalent; few fine irregular soft masses of carbonate and common fine irregular soft masses of iron-manganese; common fine prominent strong brown (7.5YR 5/6) redoximorphic concentrations; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 24 to 48 inches
Depth to carbonates: 14 to 30 inches
Depth to contrasting parent material: More than 40 inches over sandy material
Depth to gypsum and other visible salts (other than carbonates): More than 25 inches

A horizon:
Hue—10YR, 2.5Y, or N
Value—3 or 4 (2 or 3 moist)
Chroma—0 or 1
Texture—silty clay or silty clay loam

Bg horizon:
Hue—2.5Y, 5Y, or N
Value—3 to 5 (2 or 3 moist)
Chroma—0 to 2
Texture—silty clay, clay, or silty clay loam

Bk horizon:
Hue—2.5Y or 5Y
Value—4 to 6 (2 to 4 moist)
Chroma—1 or 2
Texture—silty clay, clay, or silty clay loam

C horizon:
Hue—2.5Y, 5Y, or N
Value—4 to 7 (2 to 5 moist)
Chroma—0 to 2
Texture—silty clay loam, silty clay, clay, or clay loam; thin layers of sand or silt in some pedons

Clarno Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderately slow
Landform: Moraines
Parent material: Loamy glacial till
Slope: 6 to 25 percent

Typical Pedon

Clarno loam, in an area of Ethan-Clarno loams, 9 to 15 percent slopes, 650 feet south and 150 feet east of the northwest corner of sec. 5, T. 104 N., R. 52 W.; USGS Buffalo Trading Post, SD, topographic quadrangle; lat. 43 degrees 50 minutes 46 seconds N. and long. 97 degrees 06 minutes 30 seconds W.

A—0 to 10 inches; very dark gray (10YR 3/1) loam, black (10YR 2/1) moist; weak medium subangular blocky structure parting to weak fine granular; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots throughout; 1 percent subrounded and subangular mixed gravel; slightly acid; clear wavy boundary.

Bw1—10 to 14 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to weak fine subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots throughout; many very fine tubular pores; 1 percent subrounded and subangular mixed gravel; slightly acid; clear smooth boundary.

Bw2—14 to 22 inches; brown (10YR 5/3) loam, brown (10YR 4/3) moist; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots throughout; many very fine tubular pores; 1 percent subrounded and subangular mixed gravel; slightly acid; clear wavy boundary.

Bk1—22 to 29 inches; light olive brown (2.5Y 5/3) loam, olive brown (2.5Y 4/3) moist; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots throughout; many very fine tubular pores; 7 percent calcium carbonate equivalent; common fine rounded soft masses of carbonate; 1 percent subrounded and subangular mixed gravel; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk2—29 to 44 inches; light yellowish brown (2.5Y 6/3) clay loam, light olive brown (2.5Y 5/3) moist; moderate medium prismatic structure parting to weak medium angular blocky; hard, friable, sticky and plastic; few very fine roots throughout; common very fine tubular pores; 16 percent calcium carbonate equivalent; common medium and coarse rounded soft masses of carbonate and few fine rounded black (10YR 2/1) soft masses of iron-manganese; 1 percent subrounded and subangular mixed gravel; few fine prominent yellowish brown (10YR 5/6) and strong brown (7.5YR 5/8) and common fine distinct gray (2.5Y 5/1) relict redoximorphic features; violently effervescent; moderately alkaline; gradual smooth boundary.

C—44 to 80 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; massive; hard, friable, sticky and plastic; common very fine tubular pores; 15 percent calcium carbonate equivalent; very few discontinuous carbonate coats on rock fragments; few medium rounded soft masses of carbonate and common medium irregular black (10YR 2/1) soft masses of iron-manganese; 1 percent subrounded and subangular mixed gravel; common fine and medium prominent yellowish brown (10YR 5/6) and few fine prominent strong brown (7.5YR 5/8) redoximorphic concentrations and common medium distinct grayish brown (2.5Y 5/2) redoximorphic depletions; violently effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 8 to 20 inches
Depth to carbonates: 12 to 26 inches
Depth to contrasting parent material: More than 60 inches
Depth to gypsum and other visible salts (other than carbonates): More than 40 inches

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1 or 2
Texture—loam, silt loam, or fine sandy loam

Bw horizon:
Hue—10YR or 2.5Y
Value—4 or 5 (2 to 4 moist)
Chroma—2 or 3
Texture—loam or clay loam

Bk horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—loam or clay loam

C horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—loam or clay loam

Corson Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Slow
Landform: Terraces
Parent material: Clayey lacustrine sediments
Slope: 0 to 9 percent

Typical Pedon

Corson silty clay, 2 to 6 percent slopes, 1,220 feet south and 330 feet east of the northwest corner of sec. 14, T. 102 N., R. 48 W.; USGS Garretson West, SD, topographic quadrangle; lat. 43 degrees 38 minutes 32 seconds N. and long. 96 degrees 34 minutes 13 seconds W.

Ap—0 to 6 inches; dark gray (10YR 4/1) silty clay, black (10YR 2/1) moist; moderate fine subangular blocky structure parting to moderate medium granular; hard, friable, slightly sticky and slightly plastic; common very fine and fine roots throughout; few very fine and fine tubular pores; slightly acid; abrupt smooth boundary.

Bw1—6 to 10 inches; dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, firm, sticky and plastic; common very fine and fine roots throughout; common very fine and fine tubular pores; very few discontinuous pressure faces; slightly acid; clear wavy boundary.

Bw2—10 to 16 inches; dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist; moderate medium prismatic structure parting to moderate fine subangular blocky; very hard, very firm, sticky and plastic; common very fine and fine roots throughout; common very fine and fine tubular pores; very few discontinuous pressure faces; neutral; clear wavy boundary.

Bk1—16 to 25 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; weak medium prismatic structure parting to moderate fine subangular blocky; very hard, very firm, sticky and plastic; few very fine and fine roots throughout; common very fine and fine tubular pores; 20 percent calcium carbonate equivalent; common faint patchy very dark gray (10YR 3/1) coats on vertical faces of peds and very few discontinuous pressure faces; few fine rounded soft masses of carbonate; violently effervescent; slightly alkaline; gradual wavy boundary.

Bk2—25 to 39 inches; light brownish gray (2.5Y 6/2) silty clay, light olive brown (2.5Y 5/3) moist; weak medium prismatic structure parting to moderate fine subangular blocky; very hard, very firm; few very fine and fine roots throughout; common very fine tubular pores; 20 percent calcium carbonate equivalent; very few discontinuous pressure faces and very few prominent patchy very dark brown (10YR 2/2) coats on faces of peds and in pores; common fine and medium rounded soft masses of carbonate; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk3—39 to 49 inches; light brownish gray (2.5Y 6/2) silty clay, light olive brown (2.5Y 5/3) moist; weak medium subangular blocky structure; very hard, very firm, sticky and plastic; common very fine tubular pores; 19 percent calcium carbonate equivalent; very few discontinuous pressure faces and very few prominent patchy very dark brown (10YR 2/2) coats on faces of peds and in pores; common medium and coarse rounded soft masses of carbonate; few fine distinct light olive brown (2.5Y 5/6) redoximorphic concentrations;

violently effervescent; moderately alkaline; gradual wavy boundary.

C1—49 to 63 inches; light brownish gray (2.5Y 6/2) silty clay, light olive brown (2.5Y 5/3) moist; massive; very hard, very firm, sticky and plastic; common very fine tubular pores; 15 percent calcium carbonate equivalent; very few prominent patchy brownish yellow (10YR 6/6) iron stains; few fine rounded soft masses of carbonate; common fine faint light brownish gray (2.5Y 6/2) and common fine faint very dark grayish brown (2.5Y 3/2) redoximorphic depletions; violently effervescent; moderately alkaline; gradual wavy boundary.

C2—63 to 80 inches; light brownish gray (2.5Y 6/2) silty clay, light olive brown (2.5Y 5/3) moist; massive; very hard, very firm, sticky and plastic; common very fine and fine tubular pores; 15 percent calcium carbonate equivalent; very few prominent patchy strong brown (7.5YR 5/6) iron stains; common fine distinct very dark grayish brown (2.5Y 3/2) and many fine faint light brownish gray (2.5Y 6/2) redoximorphic depletions; violently effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 20 inches
Depth to carbonates: 0 to 30 inches
Depth to contrasting parent material: More than 60 inches
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1 or 2
Texture—silty clay or clay

Bw horizon:
Hue—10YR or 2.5Y
Value—4 to 6 (2 to 5 moist)
Chroma—1 to 4
Texture—silty clay or clay

Bk horizon:
Hue—2.5Y
Value—5 or 6 (4 or 5 moist)
Chroma—2 to 4
Texture—silty clay or clay

C horizon:
Hue—2.5Y or 5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—silty clay or clay

Crofton Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderate
Landform: Dissected plains
Parent material: Calcareous loess
Slope: 6 to 25 percent

Typical Pedon

Crofton silt loam (fig. 21), in an area of Nora-Crofton complex, 6 to 9 percent slopes, 820 feet south and 640 feet west of the northeast corner of sec. 19, T. 102 N., R. 50 W.; USGS Crooks, SD, topographic quadrangle; lat. 43 degrees 37 minutes 43 seconds N. and long. 96 degrees 52 minutes 20 seconds W.

Ap—0 to 6 inches; light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine roots throughout; few medium vesicular and tubular pores; 11 percent calcium carbonate equivalent; common fine rounded soft masses of carbonate; strongly effervescent; slightly alkaline; abrupt smooth boundary.

AC—6 to 14 inches; pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; weak medium prismatic structure parting to weak fine granular; slightly hard, very friable, slightly sticky and slightly plastic; common very fine roots throughout; common medium tubular pores; 13 percent calcium carbonate equivalent; common fine and medium rounded soft masses of carbonate and common medium rounded carbonate concretions; violently effervescent; slightly alkaline; gradual smooth boundary.

C1—14 to 40 inches; light yellowish brown (10YR 6/4) silt loam, brown (10YR 5/3) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; common very fine roots throughout; common very fine and fine tubular pores; 9 percent calcium carbonate equivalent; common fine rounded soft masses of carbonate; common fine prominent strong brown (7.5YR 4/6) relict redoximorphic features; violently effervescent; moderately alkaline; gradual smooth boundary.

C2—40 to 59 inches; very pale brown (10YR 7/3) silt loam, brown (10YR 5/3) moist; massive; slightly hard, very friable, slightly sticky and slightly

plastic; common very fine tubular pores; 16 percent calcium carbonate equivalent; few fine rounded soft masses of carbonate; common fine distinct dark yellowish brown (10YR 4/6) relict redoximorphic features; violently effervescent; moderately alkaline; gradual smooth boundary.

C3—59 to 80 inches; very pale brown (10YR 7/3) silt loam, grayish brown (10YR 5/2) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; common very fine and fine tubular pores; 9 percent calcium carbonate equivalent; few fine rounded soft masses of carbonate; many medium prominent dark yellowish brown (10YR 4/6) and common fine faint gray (10YR 5/1) relict redoximorphic features; violently effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: 0 to 8 inches
Depth to contrasting parent material: More than 60 inches
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches

A horizon:
Hue—10YR
Value—4 to 6 (3 or 4 moist)
Chroma—2 or 3
Texture—silt loam

C horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—silt loam

Crossplain Series

Depth to bedrock: Very deep
Drainage class: Somewhat poorly drained
Permeability: Slow
Landform: Till plains
Parent material: Local clayey alluvium over loamy glacial till
Slope: 0 to 1 percent

Typical Pedon

Crossplain clay loam, in an area of Davison-Crossplain clay loams, 0 to 2 percent slopes, 250 feet north and 350 feet west of the southeast corner of sec. 32, T. 104 N., R. 52 W.; USGS Buffalo Trading Post, SD, topographic quadrangle; lat. 43 degrees 45 minutes 43 seconds N. and long. 97 degrees 05 minutes 27 seconds W.

A—0 to 8 inches; very dark gray (10YR 3/1) clay loam, black (10YR 2/1) moist; moderate fine granular structure; slightly hard, firm, slightly sticky and slightly plastic; common very fine and fine roots throughout; few very fine tubular pores; neutral; clear smooth boundary.

Bt1—8 to 16 inches; very dark gray (10YR 3/1) clay loam, black (10YR 2/1) moist; moderate medium prismatic structure parting to moderate fine subangular blocky; hard, firm, slightly sticky and slightly plastic; common very fine and fine roots throughout; common very fine tubular pores; few faint discontinuous clay films on faces of peds; neutral; clear smooth boundary.

Bt2—16 to 24 inches; dark gray (2.5Y 4/1) clay, very dark gray (2.5Y 3/1) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, firm, sticky and plastic; common very fine and fine roots throughout; few very fine tubular pores; few faint discontinuous clay films on faces of peds; 1 percent subrounded mixed gravel; common fine and medium faint brown (7.5YR 4/4) redoximorphic concentrations; neutral; gradual smooth boundary.

Bk—24 to 42 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; weak fine subangular blocky structure; hard, firm, sticky and plastic; few very fine and fine roots throughout; few very fine and fine tubular pores; 8 percent calcium carbonate equivalent; common fine and medium rounded soft masses of carbonate; 1 percent subrounded mixed gravel; many fine and medium prominent brown (7.5YR 4/4) redoximorphic concentrations and common fine and medium faint gray (2.5Y 5/1) redoximorphic depletions; strongly effervescent; slightly alkaline; gradual smooth boundary.

C—42 to 80 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; massive; hard, firm, sticky and plastic; 10 percent calcium carbonate equivalent; 2 percent subrounded mixed gravel; common fine and medium prominent brown (7.5YR 4/4) redoximorphic concentrations and common medium distinct gray (N 4/) redoximorphic depletions; strongly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 20 to 36 inches
Depth to carbonates: 16 to 48 inches
Depth to contrasting parent material: More than 60 inches
Depth to gypsum and other visible salts (other than carbonates): More than 40 inches

A horizon:
Hue—10YR, 2.5Y, or N
Value—3 or 4 (2 or 3 moist)
Chroma—0 or 1
Texture—clay loam, silty clay loam, or loam

Bt horizon:
Hue—10YR or 2.5Y
Value—3 to 6 (2 to 4 moist)
Chroma—1 or 2
Texture—clay loam or clay

Bk horizon:
Hue—2.5Y or 5Y
Value—5 to 7 (4 or 5 moist)
Chroma—1 to 3
Texture—clay loam or loam

C horizon:
Hue—2.5Y or 5Y
Value—5 to 7 (4 or 5 moist)
Chroma—1 to 3
Texture—loam or clay loam

Davis Series

Depth to bedrock: Very deep
Drainage class: Well drained and moderately well drained
Permeability: Moderate
Landform: Fans and flood plains
Parent material: Loamy sediments
Slope: 0 to 9 percent

Typical Pedon

Davis loam (fig. 22), 0 to 2 percent slopes, 85 feet south and 2,100 feet east of the northwest corner of sec. 15, T. 101 N., R. 48 W.; USGS Brandon, SD/IA, topographic quadrangle; lat. 43 degrees 33 minutes 30 seconds N. and long. 96 degrees 34 minutes 57 seconds W.

Ap—0 to 8 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; weak fine subangular blocky structure parting to weak fine granular; slightly hard, very friable, slightly sticky and slightly plastic; few very fine and fine roots throughout; slightly acid; abrupt smooth boundary.

BA—8 to 16 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; weak coarse and very coarse prismatic structure parting to weak medium and coarse subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; few very fine and fine roots throughout; slightly acid; gradual wavy boundary.

Bw1—16 to 23 inches; dark grayish brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; weak coarse and very coarse prismatic structure parting to weak medium and coarse subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; few very fine and fine roots throughout; few very fine tubular pores; neutral; gradual wavy boundary.

Bw2—23 to 41 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak coarse and very coarse prismatic structure parting to weak medium and coarse subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; few very fine and fine roots throughout; few very fine tubular pores; neutral; clear wavy boundary.

Bw3—41 to 47 inches; grayish brown (2.5Y 5/2) loam, very dark grayish brown (2.5Y 3/2) moist; weak medium and coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine and fine roots throughout; common very fine tubular pores; neutral; gradual wavy boundary.

Bk—47 to 80 inches; grayish brown (2.5Y 5/2) loam, very dark grayish brown (2.5Y 3/2) moist; weak coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine tubular pores; 5 percent calcium carbonate equivalent; few fine soft masses of carbonate; strongly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: More than 20 inches
Depth to carbonates: More than 20 inches
Depth to contrasting parent material: More than 60 inches
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches
Other features: Some pedons have a C horizon within a depth of 80 inches.

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1 or 2
Texture—loam or silt loam

Bw horizon:
Hue—10YR or 2.5Y
Value—3 to 5 (2 to 4 moist)
Chroma—1 to 3
Texture—loam, silt loam, silty clay loam, or clay loam

Bk horizon:
Hue—10YR or 2.5Y
Value—3 to 6 (2 to 5 moist)

Chroma—1 to 4
Texture—loam, clay loam, or silty clay loam

Davison Series

Depth to bedrock: Very deep
Drainage class: Moderately well drained
Permeability: Moderate
Landform: Till plains
Parent material: Loamy glacial till
Slope: 0 to 2 percent

Typical Pedon

Davison clay loam, in an area of Davison-Crossplain clay loams, 0 to 2 percent slopes, 200 feet west and 360 feet north of the southeast corner of sec. 16, T. 102 N., R. 51 W.; USGS Hartford North, SD, topographic quadrangle; lat. 43 degrees 37 minutes 53 seconds N. and long. 96 degrees 57 minutes 02 seconds W.

Ap—0 to 8 inches; dark gray (10YR 4/1) clay loam, very dark gray (10YR 3/1) moist; weak fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine roots throughout; common very fine vesicular and tubular pores; 6 percent calcium carbonate equivalent; 1 percent subangular and subrounded mixed gravel; strongly effervescent; moderately alkaline; abrupt smooth boundary.

Bk1—8 to 22 inches; light yellowish brown (2.5Y 6/3) clay loam, olive brown (2.5Y 4/3) moist; moderate medium prismatic structure parting to weak medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots throughout; common very fine tubular pores; 23 percent calcium carbonate equivalent; common fine and medium rounded soft masses of carbonate; 2 percent subangular and subrounded mixed gravel; few fine prominent dark yellowish brown (10YR 4/6) redoximorphic concentrations; violently effervescent; moderately alkaline; gradual smooth boundary.

Bk2—22 to 30 inches; light yellowish brown (2.5Y 6/3) clay loam, light olive brown (2.5Y 5/3) moist; moderate medium prismatic structure parting to weak medium subangular blocky; hard, friable, slightly sticky and slightly plastic; common very fine roots throughout; common very fine tubular pores; 23 percent calcium carbonate equivalent; common fine and medium rounded soft masses of carbonate; 2 percent subangular and subrounded mixed gravel; common fine and medium prominent strong brown (7.5YR 4/6) redoximorphic concentrations and few fine and medium distinct gray (2.5Y 5/1) redoximorphic depletions; violently effervescent; moderately alkaline; gradual smooth boundary.

Bk3—30 to 41 inches; light yellowish brown (2.5Y 6/3) clay loam, light olive brown (2.5Y 5/3) moist; weak medium prismatic structure parting to weak medium subangular blocky; hard, friable, slightly sticky and slightly plastic; common very fine roots throughout; common very fine tubular pores; 20 percent calcium carbonate equivalent; common fine and medium rounded soft masses of carbonate; 1 percent subangular and subrounded mixed gravel; few fine prominent brownish yellow (10YR 6/8) redoximorphic concentrations and common fine and medium distinct gray (2.5Y 5/1) redoximorphic depletions; violently effervescent; moderately alkaline; gradual smooth boundary.

C1—41 to 54 inches; light olive brown (2.5Y 5/4) clay loam, olive brown (2.5Y 4/4) moist; massive; hard, friable, slightly sticky and slightly plastic; common very fine tubular pores; 17 percent calcium carbonate equivalent; few fine and medium rounded soft masses of carbonate; 1 percent subangular and subrounded mixed gravel; common fine and medium prominent brown (7.5YR 4/4) redoximorphic concentrations and many medium distinct gray (2.5Y 6/1) redoximorphic depletions; violently effervescent; moderately alkaline; gradual smooth boundary.

C2—54 to 73 inches; light yellowish brown (2.5Y 6/3) clay loam, olive brown (2.5Y 4/3) moist; massive; hard, friable, slightly sticky and slightly plastic; common very fine tubular pores; 18 percent calcium carbonate equivalent; few prominent discontinuous black (10YR 2/1) manganese or iron-manganese stains throughout; few fine and medium rounded soft masses of carbonate; 2 percent angular and subrounded mixed gravel; many fine and medium prominent yellowish brown (10YR 5/6) redoximorphic concentrations and common fine and coarse distinct gray (2.5Y 6/1) redoximorphic depletions; violently effervescent; moderately alkaline; clear smooth boundary.

C3—73 to 80 inches; pale yellow (2.5Y 7/4) clay loam, light yellowish brown (2.5Y 6/4) moist; massive; hard, friable, sticky and plastic; common very fine tubular pores; 40 percent calcium carbonate equivalent; few fine rounded black (10YR 2/1) soft masses of iron-manganese and few fine and medium irregular soft masses of carbonate; 1 percent subangular and subrounded mixed gravel; common fine prominent brownish yellow (10YR 6/8) redoximorphic concentrations and common

fine prominent gray (2.5Y 5/1) redoximorphic depletions; violently effervescent; strongly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 15 inches
Depth to carbonates: 0 to 6 inches
Depth to contrasting parent material: More than 60 inches
Depth to gypsum and other visible salts (other than carbonates): More than 15 inches

A horizon:
Hue—10YR
Value—3 to 5 (2 or 3 moist)
Chroma—1 or 2
Texture—clay loam, loam, very fine sandy loam, or silt loam

Bk horizon:
Hue—2.5Y
Value—5 to 7 (4 or 5 moist)
Chroma—2 to 4
Texture—clay loam, loam, or sandy loam

C horizon:
Hue—2.5Y
Value—5 to 8 (4 to 6 moist)
Chroma—1 to 4
Texture—clay loam or stratified loam, sandy loam, or silt loam

Delmont Series

Depth to bedrock: Very deep
Drainage class: Somewhat excessively drained
Permeability: Moderate in the loamy sediments and very rapid in the underlying gravelly material
Landform: Outwash plains and moraines
Parent material: Loamy alluvium over glacial outwash
Slope: 0 to 25 percent

Typical Pedon

Delmont loam, in an area of Talmo-Delmont complex, 15 to 40 percent slopes, 2,400 feet north and 1,400 feet east of the southwest corner of sec. 28, T. 102 N., R. 48 W.; USGS Brandon, SD/IA, topographic quadrangle; lat. 43 degrees 36 minutes 30 seconds N. and long. 96 degrees 36 minutes 24 seconds W.

A—0 to 8 inches; very dark gray (10YR 3/1) loam, black (10YR 2/1) moist; weak fine granular structure; slightly hard, very friable; many very fine and fine roots throughout; common very fine vesicular and tubular pores; 2 percent subrounded mixed gravel; neutral; clear wavy boundary.

Bw—8 to 15 inches; very dark gray (10YR 3/1) loam, black (10YR 2/1) moist; weak medium prismatic structure parting to weak fine subangular blocky; slightly hard, very friable; common very fine and fine roots throughout; common very fine tubular pores; 5 percent subrounded mixed gravel; neutral; clear wavy boundary.

2C1—15 to 24 inches; grayish brown (10YR 5/2) gravelly loamy sand, dark grayish brown (10YR 4/2) moist; single grain; loose; few very fine roots throughout; 6 percent calcium carbonate equivalent; few patchy carbonate coats on sand and gravel; 20 percent subrounded mixed gravel; strongly effervescent; slightly alkaline; gradual smooth boundary.

2C2—24 to 73 inches; light brownish gray (10YR 6/2) gravelly sand, grayish brown (10YR 5/2) moist; single grain; loose; 6 percent calcium carbonate equivalent; very few patchy carbonate coats on sand and gravel; 25 percent subrounded mixed gravel; strongly effervescent; slightly alkaline; gradual smooth boundary.

2C3—73 to 80 inches; light gray (10YR 7/2) sand, brown (10YR 5/3) moist; single grain; loose; 6 percent calcium carbonate equivalent; 3 percent subrounded mixed gravel; strongly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 10 to 20 inches
Depth to carbonates: 14 to 20 inches
Depth to contrasting parent material: 14 to 20 inches over gravelly material
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1 or 2
Texture—loam, very fine sandy loam, or silt loam

Bw horizon:
Hue—10YR
Value—3 to 5 (2 or 3 moist)
Chroma—1 to 3
Texture—loam, sandy loam, or fine sandy loam

2C horizon:
Hue—5YR to 2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—gravelly sand, gravelly loamy sand, very gravelly loamy sand, or very gravelly sand

Dempster Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderate in the silty sediments and very rapid in the gravelly material
Landform: Outwash plains
Parent material: Loess or silty alluvium over glacial outwash
Slope: 0 to 6 percent

Typical Pedon

Dempster silt loam (fig. 23), 0 to 2 percent slopes, 2,100 feet north and 150 feet east of the southwest corner of sec. 35, T. 103 N., R. 51 W.; USGS Hartford North, SD, topographic quadrangle; lat. 43 degrees 40 minutes 48 seconds N. and long. 96 degrees 55 minutes 47 seconds W.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; weak fine granular structure; slightly hard, friable, slightly sticky; many very fine and fine roots throughout; common very fine tubular pores; slightly acid; abrupt smooth boundary.
Bw1—9 to 15 inches; grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to weak coarse subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots throughout; common very fine tubular pores; neutral; clear wavy boundary.
Bw2—15 to 30 inches; light yellowish brown (10YR 6/4) silty clay loam, dark yellowish brown (10YR 4/4) moist; weak coarse prismatic structure parting to weak medium subangular blocky; hard, friable, slightly sticky and slightly plastic; common very fine and fine roots throughout; common very fine tubular pores; neutral; gradual wavy boundary.
Bw3—30 to 37 inches; light yellowish brown (10YR 6/4) silty clay loam, dark yellowish brown (10YR 4/4) moist; weak coarse prismatic structure parting to weak medium subangular blocky; hard, friable, slightly sticky and slightly plastic; few very fine and fine roots throughout; few very fine tubular pores; neutral; clear wavy boundary.
2C1—37 to 50 inches; brown (10YR 5/3) gravelly loamy sand, brown (10YR 4/3) moist; single grain; loose; 7 percent calcium carbonate equivalent; few patchy carbonate coats on sand and gravel; 20 percent subrounded mixed gravel; slightly effervescent; slightly alkaline; gradual wavy boundary.
2C2—50 to 80 inches; light yellowish brown (10YR 6/4) very gravelly loamy sand, yellowish brown (10YR 5/4) moist; single grain; loose; 6 percent calcium carbonate equivalent; very few patchy carbonate coats on sand and gravel; 50 percent subrounded mixed gravel; slightly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 10 to 20 inches
Depth to carbonates: 20 to 40 inches
Depth to contrasting parent material: 20 to 40 inches over gravelly material
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches
Other features: Some pedons have a Bk horizon.

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1 or 2
Texture—silt loam or silty clay loam

Bw horizon:
Hue—10YR or 2.5Y
Value—4 to 6 (3 to 5 moist)
Chroma—2 to 4
Texture—silty clay loam or silt loam

2C horizon:
Hue—7.5YR, 10YR, or 2.5Y
Value—5 or 6 (4 or 5 moist)
Chroma—2 to 4
Texture—gravelly loamy sand, gravelly sand, very gravelly sand, or very gravelly loamy sand

Dimo Series

Depth to bedrock: Very deep
Drainage class: Somewhat poorly drained
Permeability: Moderate in the loamy sediments and very rapid in the underlying gravelly material
Landform: Flood plains
Parent material: Loamy alluvium over glacial outwash
Slope: 0 to 2 percent

Typical Pedon

Dimo clay loam (fig. 24), in an area of Enet-Dimo complex, 0 to 2 percent slopes, 176 feet south and 148 feet east of the northwest corner of sec. 1, T. 104 N., R. 49 W.; USGS Dell Rapids, SD, topographic quadrangle; lat. 43 degrees 50 minutes 49 seconds N. and long. 96 degrees 40 minutes 12 seconds W.

Ap—0 to 7 inches; very dark gray (10YR 3/1) clay loam, black (10YR 2/1) moist; weak coarse subangular blocky structure parting to weak fine granular; very hard, friable, slightly sticky and

slightly plastic; common very fine and fine roots throughout; neutral; abrupt smooth boundary.

Bw1—7 to 13 inches; very dark gray (10YR 3/1) clay loam, black (10YR 2/1) moist; weak coarse prismatic structure parting to weak medium subangular blocky; very hard, friable, slightly sticky and slightly plastic; common very fine and fine roots throughout; common very fine tubular pores; neutral; clear wavy boundary.

Bw2—13 to 22 inches; very dark gray (10YR 3/1) clay loam, black (10YR 2/1) moist; weak coarse prismatic structure parting to weak medium subangular blocky; very hard, friable, slightly sticky and slightly plastic; common very fine and fine roots throughout; common very fine tubular pores; neutral; gradual smooth boundary.

Bw3—22 to 35 inches; dark gray (10YR 4/1) clay loam, black (10YR 2/1) moist; weak coarse prismatic structure parting to weak medium subangular blocky; very hard, friable, slightly sticky and slightly plastic; common very fine and fine roots throughout; common very fine tubular pores; common fine prominent yellowish brown (10YR 5/8) redoximorphic concentrations; neutral; clear wavy boundary.

BC—35 to 39 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak coarse subangular blocky structure; very hard, friable, slightly sticky and slightly plastic; few very fine and fine roots throughout; 7 percent calcium carbonate equivalent; very few patchy manganese or iron-manganese stains on sand and gravel; 8 percent subrounded mixed gravel; common fine prominent yellowish brown (10YR 5/8) redoximorphic concentrations; very slightly effervescent; neutral; clear wavy boundary.

2C—39 to 80 inches; grayish brown (2.5Y 5/2) gravelly loamy sand, dark grayish brown (2.5Y 4/2) moist; single grain; loose; 6 percent calcium carbonate equivalent; very few patchy carbonate coats on sand and gravel and very few patchy manganese or iron-manganese stains on sand and gravel; 20 percent subrounded mixed gravel; few fine prominent yellowish brown (10YR 5/8) redoximorphic concentrations; very slightly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 20 to 40 inches
Depth to carbonates: 20 to 40 inches
Depth to contrasting parent material: 20 to 40 inches over gravelly material
Depth to gypsum and other visible salts (other than carbonates): 20 to 40 inches
Other features: Some pedons have a Bk horizon.

A horizon:
Hue—10YR
Value—3 or 4 (2 moist)
Chroma—1 or 2
Texture—clay loam, loam, or silty clay loam

Bw horizon:
Hue—10YR or 2.5Y
Value—3 to 5 (2 to 4 moist)
Chroma—1 or 2
Texture—clay loam, loam, or sandy clay loam

2C horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—gravelly loamy sand, gravelly sand, very gravelly sand, or very gravelly loamy sand

Dobalt Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderately slow
Landform: Till plains
Parent material: Loamy eolian material over loamy glacial till
Slope: 0 to 6 percent

Typical Pedon

Dobalt loam, 2 to 6 percent slopes, 195 feet north and 1,716 feet west of the southeast corner of sec. 22, T. 102 N., R. 49 W.; USGS Sioux Falls East, SD, topographic quadrangle; lat. 43 degrees 37 minutes 01 second N. and long. 96 degrees 41 minutes 53 seconds W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure parting to weak fine granular; slightly hard, very friable, slightly sticky and slightly plastic; common very fine and fine roots throughout; moderately acid; abrupt smooth boundary.

Bw1—8 to 13 inches; brown (10YR 4/3) loam, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure parting to weak medium subangular blocky; slightly hard, very friable, slightly sticky and slightly plastic; common very fine and fine roots throughout; common very fine

and fine tubular pores; slightly acid; gradual wavy boundary.

Bw2—13 to 19 inches; brown (10YR 5/3) loam, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure parting to weak medium and coarse subangular blocky; slightly hard, very friable, slightly sticky and slightly plastic; common very fine and fine roots throughout; common very fine and fine tubular pores; 1 percent subrounded mixed gravel; neutral; clear wavy boundary.

Bw3—19 to 29 inches; yellowish brown (10YR 5/4) sandy clay loam, brown (10YR 4/3) moist; weak coarse prismatic structure parting to weak medium and coarse subangular blocky; hard, friable, slightly sticky and slightly plastic; common very fine and fine roots throughout; common very fine tubular pores; few mixed stones and cobbles in the lower part of the horizon; 2 percent subrounded mixed gravel; few fine prominent yellowish brown (10YR 5/8) relict redoximorphic features; neutral; clear wavy boundary.

2Bk—29 to 59 inches; light yellowish brown (2.5Y 6/3) clay loam, light olive brown (2.5Y 5/3) moist; weak coarse prismatic structure parting to weak medium subangular blocky; hard, firm, slightly sticky and slightly plastic; common very fine and fine roots throughout; common very fine tubular pores; 15 percent calcium carbonate equivalent; common medium and coarse rounded soft masses of carbonate; 5 percent subangular mixed gravel; common fine prominent yellowish brown (10YR 5/8) redoximorphic concentrations and common fine prominent gray (5Y 6/1) redoximorphic depletions; violently effervescent; moderately alkaline; gradual wavy boundary.

2C—59 to 80 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; massive; hard, firm, slightly sticky and slightly plastic; common very fine and fine tubular pores; 14 percent calcium carbonate equivalent; few medium rounded soft masses of carbonate; 4 percent subangular mixed gravel; many fine and medium prominent yellowish brown (10YR 5/8) redoximorphic concentrations and many fine and medium prominent gray (5Y 6/1) redoximorphic depletions; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 20 inches
Depth to carbonates: 20 to 40 inches
Depth to contrasting parent material: 20 to 40 inches over loamy glacial till
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1 or 2
Texture—loam or silt loam

Bw horizon:
Hue—10YR or 2.5
Value—4 to 6 (3 or 4 moist)
Chroma—2 to 4
Texture—loam, fine sandy loam, sandy loam, sandy clay loam, or silt loam

2Bk horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—clay loam or loam

2C horizon:
Hue—2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—clay loam or loam

Egan Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderately slow
Landform: Till plains and moraines
Parent material: Silty glacial till over loamy glacial till
Slope: 0 to 9 percent

Typical Pedon

Egan silty clay loam (fig. 25), in an area of Egan-Wentworth-Trent silty clay loams, 1 to 6 percent slopes, 105 feet south and 2,340 feet east of the northwest corner of sec. 10, T. 104 N., R. 52 W.; USGS Buffalo Trading Post, SD, topographic quadrangle; lat. 43 degrees 50 minutes 03 seconds N. and long. 97 degrees 03 minutes 37 seconds W.

Ap—0 to 10 inches; very dark grayish brown (10YR 3/2) silty clay loam, very dark brown (10YR 2/2) moist; weak fine and medium subangular blocky structure parting to weak fine granular; hard, friable, sticky and plastic; common fine roots throughout; slightly acid; abrupt smooth boundary.

Bw1—10 to 20 inches; brown (10YR 5/3) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate coarse prismatic structure parting to

moderate medium subangular blocky; hard, friable, sticky and plastic; common very fine and fine roots throughout; common very fine and fine tubular pores; slightly acid; clear wavy boundary.

Bw2—20 to 28 inches; pale brown (10YR 6/3) silty clay loam, dark grayish brown (10YR 4/2) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; hard, friable, sticky and plastic; common very fine and fine roots throughout; common very fine and fine tubular pores; neutral; abrupt wavy boundary.

2Bk1—28 to 35 inches; light brownish gray (2.5Y 6/2) clay loam, olive brown (2.5Y 4/3) moist; weak coarse prismatic structure parting to weak medium subangular blocky; very hard, friable, slightly sticky and slightly plastic; common fine roots throughout; common very fine and fine tubular pores; 17 percent calcium carbonate equivalent; common fine irregular soft masses of carbonate; 2 percent subrounded and subangular mixed gravel; common fine prominent strong brown (7.5YR 5/8) relict redoximorphic features; strongly effervescent; slightly alkaline; gradual wavy boundary.

2Bk2—35 to 43 inches; pale yellow (2.5Y 7/4) clay loam, olive brown (2.5Y 4/4) moist; weak coarse prismatic structure parting to weak coarse subangular blocky; very hard, firm, slightly sticky and slightly plastic; few fine roots throughout; few very fine tubular pores; 16 percent calcium carbonate equivalent; common fine irregular soft masses of carbonate; 3 percent subrounded and subangular mixed gravel; common fine prominent strong brown (7.5YR 5/8) relict redoximorphic features; strongly effervescent; moderately alkaline; clear wavy boundary.

2C1—43 to 65 inches; pale yellow (2.5Y 7/4) clay loam, olive brown (2.5Y 4/4) moist; massive; very hard, firm, slightly sticky and slightly plastic; few fine roots throughout; few very fine tubular pores; 8 percent calcium carbonate equivalent; few fine irregular soft masses of carbonate; 3 percent subrounded and subangular mixed gravel; common fine prominent strong brown (7.5YR 5/8) redoximorphic concentrations; strongly effervescent; moderately alkaline; gradual wavy boundary.

2C2—65 to 80 inches; pale yellow (2.5Y 7/4) clay loam, olive brown (2.5Y 4/4) moist; massive; very hard, firm, sticky and plastic; few fine roots throughout; few very fine tubular pores; 7 percent calcium carbonate equivalent; common fine rounded soft masses of iron-manganese; 3 percent subrounded and subangular mixed gravel; common fine prominent strong brown (7.5YR 5/8) redoximorphic concentrations and common fine prominent light gray (2.5Y 7/1) redoximorphic depletions; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 8 to 19 inches
Depth to carbonates: 15 to 30 inches
Depth to contrasting parent material: 24 to 40 inches over loamy glacial till
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches
Other features: Some pedons have a Bk horizon.

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1 or 2
Texture—silty clay loam or silt loam

Bw horizon:
Hue—10YR or 2.5Y
Value—4 to 6 (3 or 4 moist)
Chroma—2 or 3
Texture—silty clay loam or silt loam

2Bk horizon:
Hue—2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—clay loam or loam

2C horizon:
Hue—2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—clay loam or loam

Enet Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderate in the loamy sediments and very rapid in the gravelly material
Landform: Outwash plains and flood plains
Parent material: Loamy alluvium over glacial outwash
Slope: 0 to 6 percent

Typical Pedon

Enet loam (fig. 26), in an area of Delmont-Enet loams, 0 to 2 percent slopes, 2,450 feet south and 50 feet west of the northeast corner of sec. 28, T. 110 N., R.

48 W.; USGS Brandon, SD/IA, topographic quadrangle; lat. 43 degrees 31 minutes 49 seconds N. and long. 96 degrees 35 minutes 29 seconds W.

A—0 to 7 inches; very dark gray (10YR 3/1) loam, black (10YR 2/1) moist; weak medium subangular blocky structure parting to moderate fine granular; slightly hard, very friable, slightly plastic; many very fine and fine roots throughout; many very fine and fine tubular pores; slightly acid; clear smooth boundary.

Bw—7 to 23 inches; very dark gray (10YR 3/1) loam, black (10YR 2/1) moist; weak coarse prismatic structure parting to moderate fine subangular blocky; slightly hard, very friable, slightly sticky and slightly plastic; common very fine and fine roots throughout; common very fine and fine tubular pores; neutral; clear wavy boundary.

BC—23 to 28 inches; brown (10YR 5/3) sandy loam, very dark grayish brown (10YR 3/2) moist; weak coarse subangular blocky structure; slightly hard, friable; few very fine and fine roots throughout; common very fine and fine tubular pores; 5 percent subrounded mixed gravel; neutral; gradual wavy boundary.

2C—28 to 80 inches; light yellowish brown (10YR 6/4) gravelly sand, yellowish brown (10YR 5/4) moist; single grain; loose; 6 percent calcium carbonate equivalent; very few patchy carbonate coats on sand and gravel; 20 percent subrounded mixed gravel; slightly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 20 to 40 inches
Depth to carbonates: 20 to 40 inches
Depth to contrasting parent material: 20 to 40 inches over gravelly material
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches
Other features: Some pedons have a Bk horizon.

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1 or 2
Texture—loam, silt loam, or fine sandy loam

Bw horizon:
Hue—10YR
Value—3 to 5 (2 or 3 moist)
Chroma—1 to 3
Texture—loam, clay loam, or sandy clay loam

2C horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—gravelly sand, gravelly loamy sand, very gravelly loamy sand, or very gravelly sand

Ethan Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderately slow
Landform: Till plains and moraines
Parent material: Loamy glacial till
Slope: 1 to 40 percent

Typical Pedon

Ethan loam (fig. 27), in an area of Ethan-Egan complex, 6 to 9 percent slopes, 1,820 feet north and 150 feet west of the southeast corner of sec. 23, T. 103 N., R. 52 W.; USGS Humboldt, SD, topographic quadrangle; lat. 43 degrees 42 minutes 30 seconds N. and long. 97 degrees 01 minute 49 seconds W.

Ap—0 to 9 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots throughout; 14 percent calcium carbonate equivalent; 2 percent subangular and subrounded mixed gravel; strongly effervescent; slightly alkaline; clear wavy boundary.

Bk1—9 to 23 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; hard, friable, sticky and plastic; few very fine and fine roots throughout; few very fine tubular pores; 16 percent calcium carbonate equivalent; common fine and medium irregular soft masses of carbonate; 2 percent subangular and subrounded mixed gravel; few fine prominent strong brown (7.5YR 5/8) relict redoximorphic features; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk2—23 to 31 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; weak coarse prismatic structure parting to weak medium subangular blocky; hard, friable, sticky and plastic; few very fine and fine roots throughout; few very fine tubular pores; 19 percent calcium carbonate equivalent; common fine and medium irregular soft masses of carbonate; 3 percent subangular and subrounded mixed gravel; few fine prominent strong brown (7.5YR 5/8) relict redoximorphic features; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk3—31 to 39 inches; light brownish gray (2.5Y 6/2)

clay loam, grayish brown (2.5Y 5/2) moist; weak coarse subangular blocky structure; hard, friable, sticky and plastic; few very fine tubular pores; 15 percent calcium carbonate equivalent; few fine irregular soft masses of carbonate; 3 percent subangular and subrounded mixed gravel; common fine and medium prominent strong brown (7.5YR 5/8) relict redoximorphic features; strongly effervescent; moderately alkaline; gradual wavy boundary.

C—39 to 80 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; massive; hard, firm, sticky and plastic; 14 percent calcium carbonate equivalent; 4 percent subangular and subrounded mixed gravel; common fine and medium prominent strong brown (7.5YR 5/8) and common fine and medium faint gray (2.5Y 6/1) relict redoximorphic features; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 10 inches
Depth to carbonates: 0 to 5 inches
Depth to contrasting parent material: More than 60 inches
Depth to gypsum and other visible salts (other than carbonates): More than 40 inches

A horizon:
Hue—10YR or 2.5Y
Value—3 to 5 (2 or 3 moist)
Chroma—2 or 3
Texture—loam or clay loam

Bk horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (3 to 6 moist)
Chroma—2 to 4
Texture—clay loam or loam

C horizon:
Hue—2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—clay loam or loam

Flandreau Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderate in the loamy sediments, rapid in the underlying sandy material, and moderately slow in the underlying loamy glacial till
Landform: Till plains
Parent material: Loamy eolian material over sandy eolian material over loamy glacial till
Slope: 0 to 9 percent

Typical Pedon

Flandreau loam (fig. 28), in an area of Flandreau-Thurman complex, 2 to 6 percent slopes, 2,350 feet south and 350 feet west of the northeast corner of sec. 34, T. 103 N., R. 49 W.; USGS Renner, SD, topographic quadrangle; lat. 43 degrees 40 minutes 59 seconds N. and long. 96 degrees 41 minutes 32 seconds W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; weak fine granular structure; slightly hard, friable; common very fine roots throughout; neutral; abrupt smooth boundary.

Bw1—7 to 15 inches; dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; weak medium prismatic structure parting to weak fine subangular blocky; slightly hard, friable; common very fine roots throughout; neutral; gradual wavy boundary.

Bw2—15 to 27 inches; yellowish brown (10YR 5/4) loam, brown (10YR 4/3) moist; weak medium prismatic structure parting to moderate medium subangular blocky; hard, friable; common very fine roots throughout; common very fine and fine tubular pores; neutral; clear wavy boundary.

Bw3—27 to 33 inches; yellowish brown (10YR 5/4) loam, brown (10YR 4/3) moist; weak medium prismatic structure parting to weak medium subangular blocky; hard, friable; few very fine roots throughout; few very fine and fine tubular pores; neutral; gradual wavy boundary.

Bw4—33 to 39 inches; yellowish brown (10YR 5/4) sandy loam, brown (10YR 4/3) moist; weak medium prismatic structure parting to weak fine subangular blocky; slightly hard, very friable; common very fine tubular pores; slightly alkaline; gradual wavy boundary.

2C1—39 to 45 inches; pale brown (10YR 6/3) loamy sand, brown (10YR 5/3) moist; single grain; loose; 3 percent calcium carbonate equivalent; slightly effervescent; slightly alkaline; abrupt wavy boundary.

2C2—45 to 78 inches; light yellowish brown (2.5Y 6/3), stratified loamy fine sand and fine sandy loam, light olive brown (2.5Y 5/3) moist; single grain; loose; 5 percent calcium carbonate equivalent; few fine rounded black (10YR 2/1) soft masses of iron-manganese; common fine and medium prominent

Figure 18.—Profile of Alcester silty clay loam. The surface layer is about 16 inches thick. Depth is marked in feet.

Figure 19.—Profile of Arlo loam. Gravelly sand is at a depth of about 30 inches. Depth is marked in feet.

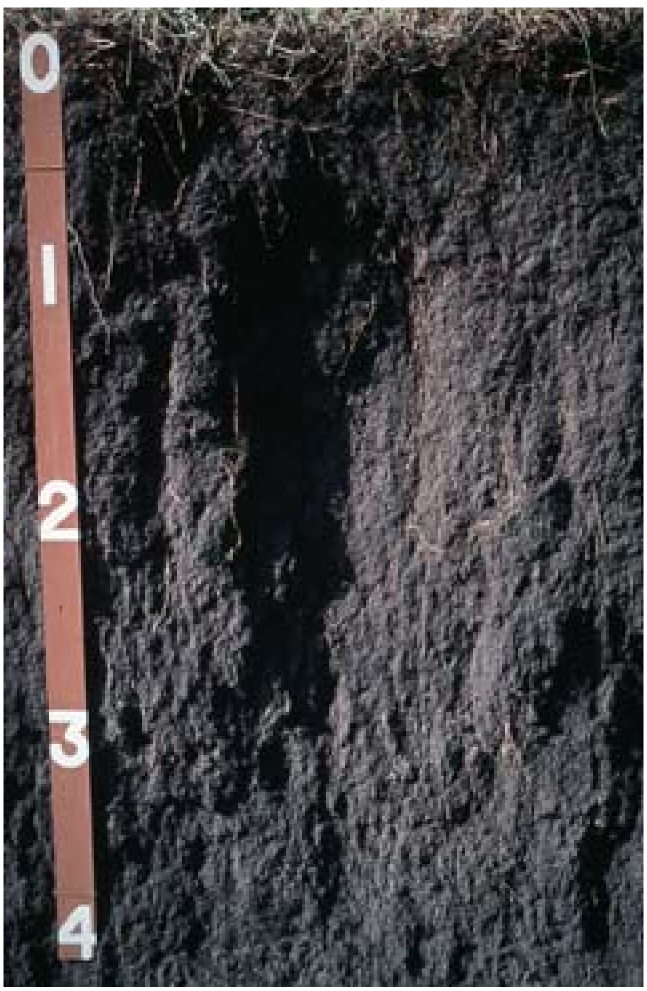

Figure 20.—Profile of Clamo silty clay. This soil is poorly drained. The depth to calcium carbonate is about 25 inches. Depth is marked in feet.

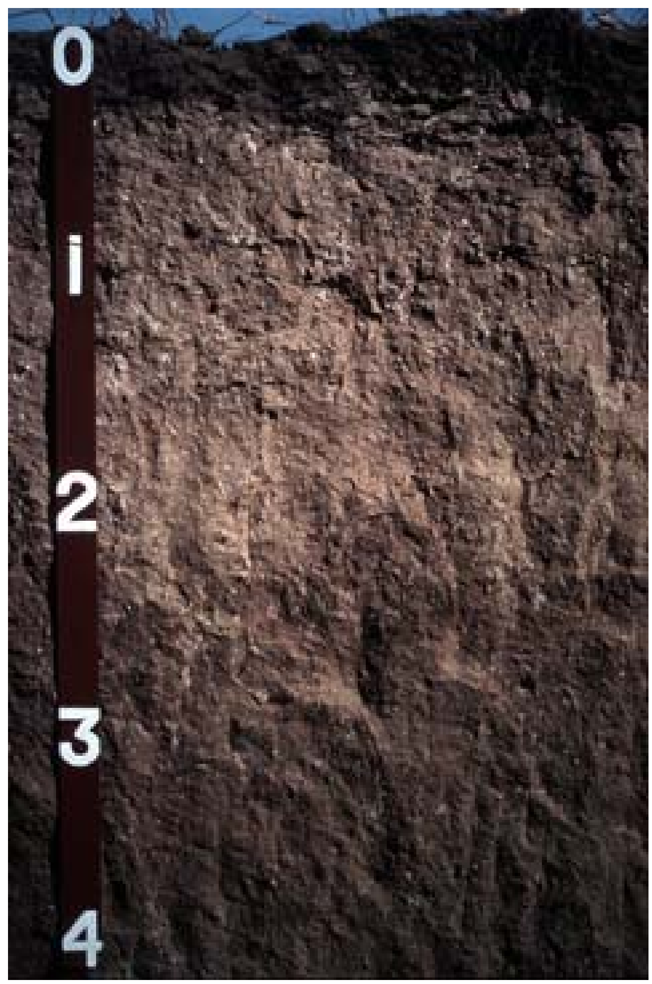

Figure 21.—Profile of Crofton silt loam. Accumulations of calcium carbonate begin near the surface. Depth is marked in feet.

Figure 22.—Profile of Davis loam. The loamy sediments are dark to a depth of more than 20 inches. Depth is marked in feet.

Figure 23.—Profile of Dempster silt loam. Gravelly loamy sand is at a depth of about 32 inches. Depth is marked in feet.

Figure 24.—Profile of Dimo clay loam. Gravelly loamy sand is at a depth of about 26 inches. Depth is marked in feet.

Figure 25.—Profile of Egan silty clay loam. Silty material is about 2 to 3 feet deep over loamy till. Depth is marked in feet.

Figure 26.—Profile of Enet loam. Gravelly sand is at a depth of about 28 inches. Depth is marked in feet.

Figure 27.—Profile of Ethan loam. The dark surface layer is about 9 inches thick, and carbonates are at the surface. Depth is marked in feet.

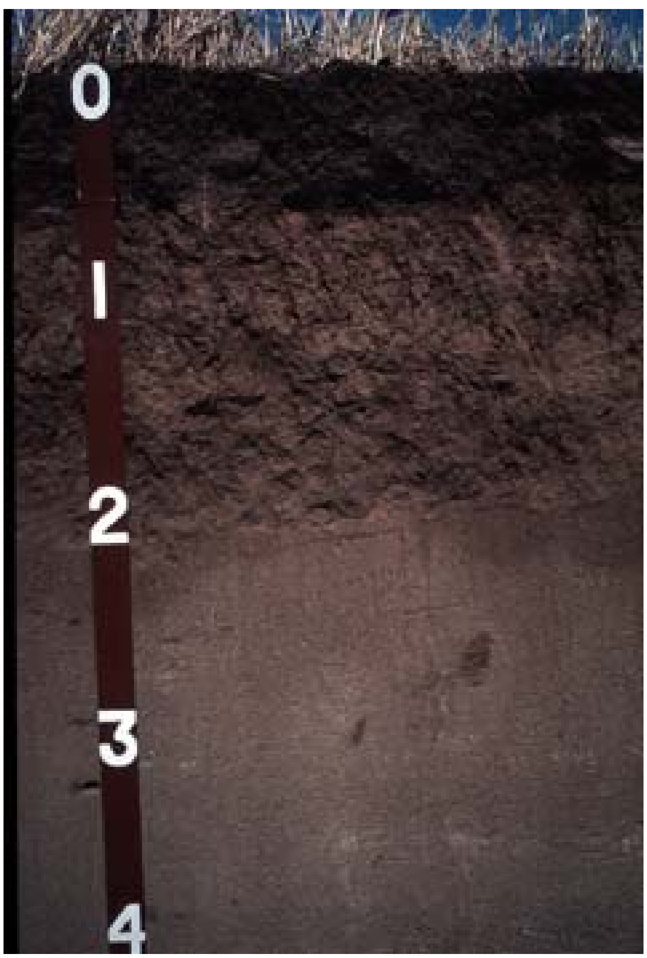

Figure 28.—Profile of Flandreau loam. The depth to sandy loam material ranges from 25 to 40 inches. Depth is marked in feet.

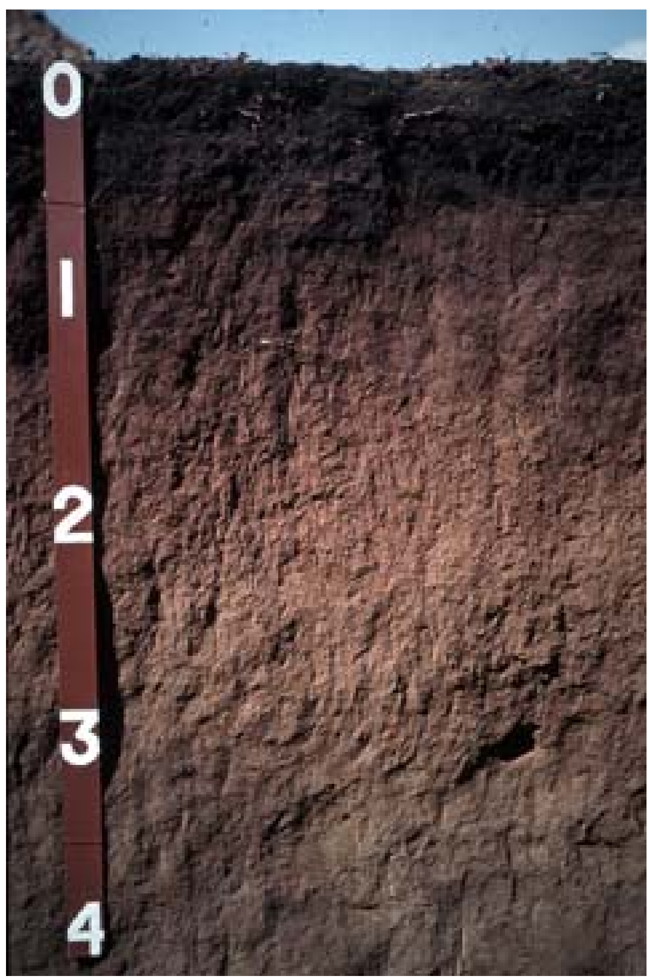

Figure 29.—Profile of Grovena loam. Loamy eolian material with accumulations of calcium carbonate is at a depth of about 30 inches. Depth is marked in feet.

Figure 30.—Profile of Houdek clay loam. Accumulations of calcium carbonate begin at a depth of about 30 inches. Depth is marked in feet.

Figure 31.—Profile of Huntimer silty clay loam. Cracking of the soil when it is dry allows dark topsoil material to fall down into the subsoil. Depth is marked in feet.

Figure 32.—Profile of Ihlen silty clay loam. The silty clay loam loess is about 24 inches thick over reddish brown Sioux quartzite. Depth is marked in feet.

Figure 33.—Profile of Janude fine sandy loam. Note the stratified sediments. Depth is marked in feet.

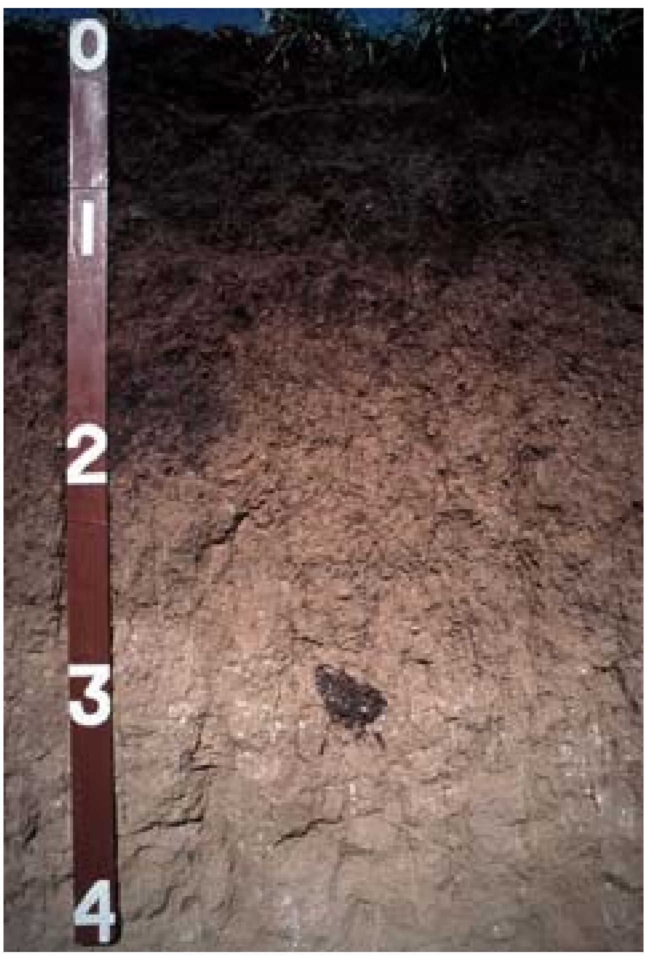

Figure 34.—Profile of Moody silty clay loam. This soil is silty clay loam to a depth of about 35 inches and is silt loam with accumulations of calcium carbonate below that depth. Depth is marked in feet.

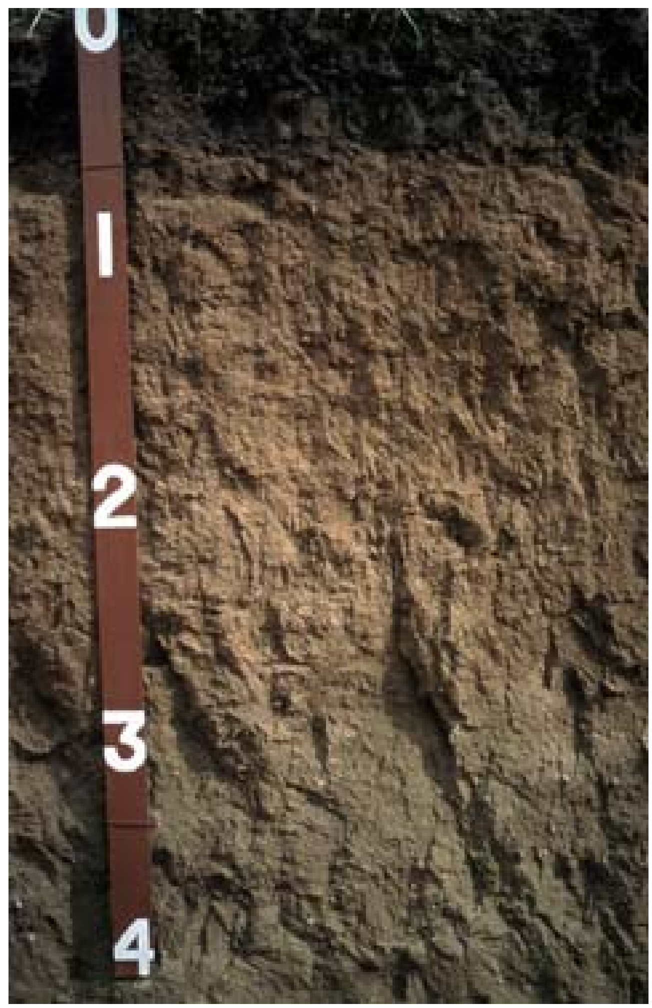

Figure 35.—Profile of Nora silty clay loam. Accumulations of calcium carbonate begin at a depth of about 22 inches. Depth is marked in feet.

Figure 36.—Profile of Shindler clay loam. Carbonates are at the surface, but accumulations of calcium carbonate begin at a depth of about 11 inches. Depth is marked in feet.

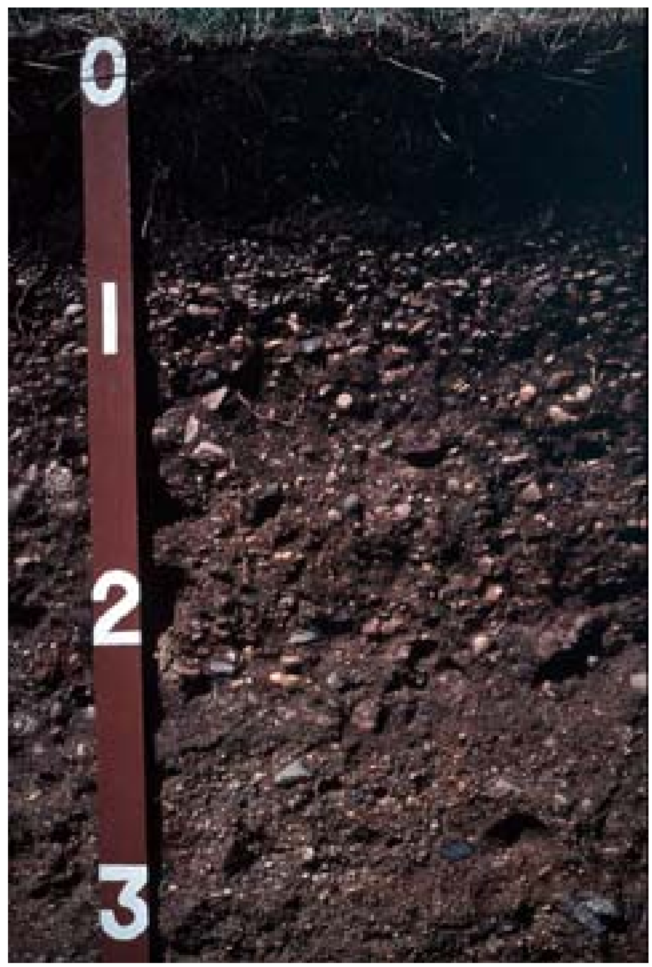

Figure 37.—Profile of Talmo gravelly loam. Very gravelly loamy sand and very gravelly sand are below a depth of about 7 inches. Depth is marked in feet.

Figure 38.—Profile of Tetonka silt loam. This poorly drained soil has a dark surface layer about 7 inches thick. Depth is marked in feet.

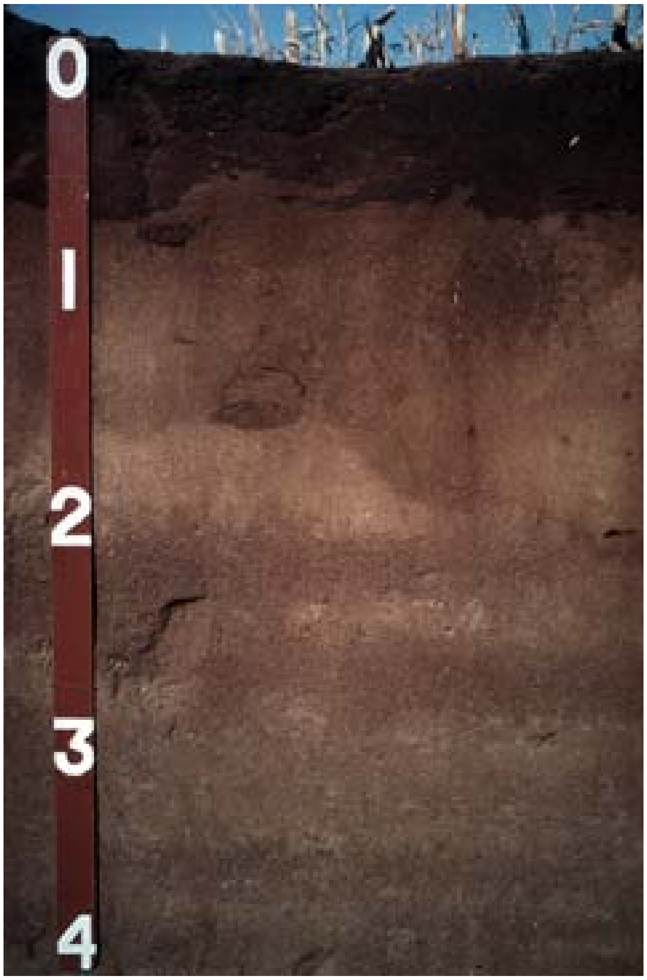

Figure 39.—Profile of Thurman fine sandy loam. The surface layer is about 6 inches thick. Loamy fine sand and sand are below a depth of about 18 inches. Depth is marked in feet.

Figure 40.—Profile of Trent silty clay loam. Dark colors extend to a depth of more than 23 inches. Depth is marked in feet.

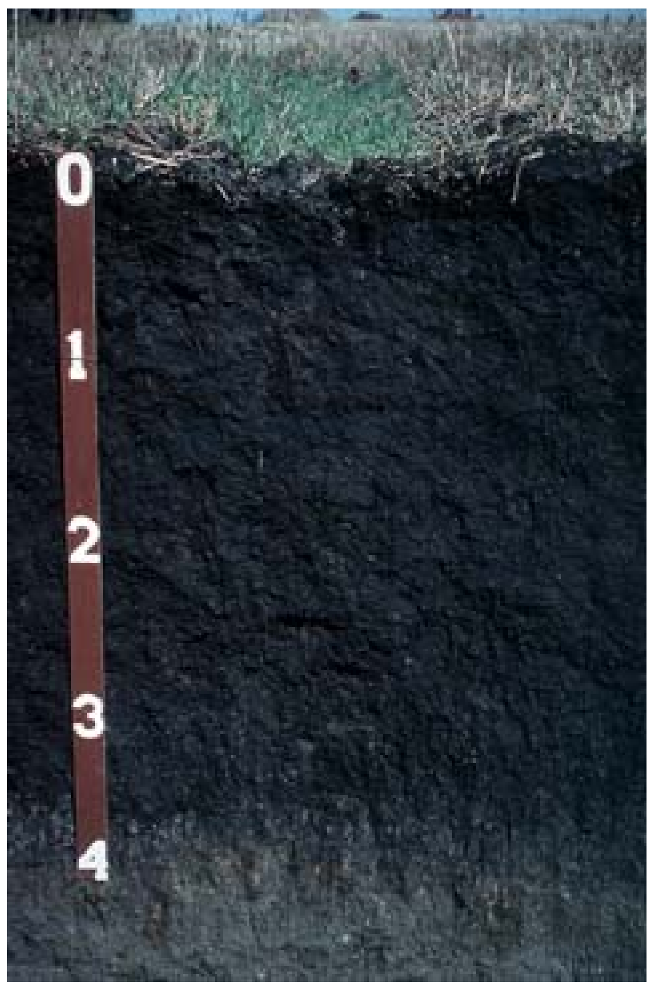

Figure 41.—Profile of Worthing silty clay loam. This soil is very poorly drained. The subsoil begins at a depth of about 16 inches. Depth is marked in feet.

redoximorphic concentrations and common fine distinct gray (10YR 5/1) redoximorphic depletions; strongly effervescent; moderately alkaline; gradual wavy boundary.

3C3—78 to 80 inches; light yellowish brown (2.5Y 6/3) clay loam, olive brown (2.5Y 4/3) moist; massive; very hard, friable, sticky and plastic; common very fine tubular pores; 7 percent calcium carbonate equivalent; few fine rounded soft masses of carbonate and common fine and medium rounded black (10YR 2/1) soft masses of iron-manganese; 1 percent subangular mixed gravel; many fine and medium prominent strong brown (7.5YR 5/8) and olive yellow (2.5Y 6/6) redoximorphic concentrations and common fine and medium distinct grayish brown (2.5Y 5/2) redoximorphic depletions; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 10 to 20 inches
Depth to carbonates: 25 to 40 inches
Depth to contrasting parent material: 25 to 40 inches over sandy material over loamy glacial till at a depth of more than 60 inches
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches
Other features: Some pedons have a Bk horizon.

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1 or 2
Texture—loam or silt loam

Bw horizon:
Hue—10YR or 2.5Y
Value—4 or 5 (2 to 4 moist)
Chroma—2 to 4
Texture—loam, silt loam, clay loam, or sandy loam

2C horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—loamy sand, loamy fine sand, or fine sand

3C horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—clay loam or loam

Gayville Series

Depth to bedrock: Very deep
Drainage class: Somewhat poorly drained
Permeability: Very slow
Landform: Flood plains
Parent material: Alluvium
Slope: 0 to 2 percent

Typical Pedon

Gayville silt loam, in an area of Moody-Gayville complex, 0 to 3 percent slopes, 2,227 feet south and 2,635 feet west of the northeast corner of sec. 27, T. 104 N., R. 48 W.; USGS Dell Rapids Southeast, SD, topographic quadrangle; lat. 43 degrees 47 minutes 02 seconds N. and long. 96 degrees 34 minutes 52 seconds W.

E—0 to 2 inches; gray (10YR 6/1) silt loam, very dark gray (10YR 3/1) moist; weak thin platy structure; soft, very friable; many very fine to medium roots throughout; neutral; abrupt wavy boundary.

Btn1—2 to 7 inches; dark gray (10YR 4/1) silty clay, black (10YR 2/1) moist; strong medium columnar structure parting to moderate fine subangular blocky; very hard, firm, sticky and plastic; common very fine roots between peds; few very fine tubular pores; few faint continuous gray (10YR 6/1) coats on tops of columns and few faint discontinuous clay films on faces of peds; slightly alkaline; clear smooth boundary.

Btn2—7 to 13 inches; grayish brown (10YR 5/2) silty clay, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, friable, sticky and plastic; common very fine roots between peds; few faint discontinuous clay films on faces of peds; slightly alkaline; clear wavy boundary.

Bkz—13 to 26 inches; light yellowish brown (2.5Y 6/3) silty clay loam, grayish brown (2.5Y 5/2) moist; weak medium prismatic structure parting to weak fine subangular blocky; hard, friable, slightly sticky and slightly plastic; common very fine roots throughout; few very fine tubular pores; 15 percent calcium carbonate equivalent; many medium and coarse irregular soft masses of carbonate and few fine salt masses; violently effervescent; strongly alkaline; clear wavy boundary.

C1—26 to 42 inches; pale yellow (2.5Y 7/3) clay loam, light yellowish brown (2.5Y 6/4) moist; massive; hard, friable, slightly sticky and slightly plastic; few very fine roots throughout; 15 percent calcium

carbonate equivalent; common medium irregular soft masses of carbonate; few fine distinct gray (10YR 5/1) redoximorphic depletions; violently effervescent; strongly alkaline; clear smooth boundary.

C2—42 to 51 inches; pale yellow (2.5Y 7/3) clay loam, light brownish gray (2.5Y 6/2) moist; massive; hard, friable, slightly sticky and slightly plastic; 17 percent calcium carbonate equivalent; many medium and coarse rounded carbonate concretions; common fine distinct gray (10YR 5/1) redoximorphic depletions; violently effervescent; moderately alkaline; clear smooth boundary.

C3—51 to 68 inches; light brownish gray (2.5Y 6/2) loam, grayish brown (2.5Y 5/2) moist; massive; slightly hard, friable; 6 percent calcium carbonate equivalent; very few prominent discontinuous very dark gray (10YR 3/1) manganese or iron-manganese stains; common medium prominent yellowish brown (10YR 5/6) redoximorphic concentrations and common fine distinct gray (10YR 5/1) redoximorphic depletions; strongly effervescent; moderately alkaline; gradual smooth boundary.

C4—68 to 80 inches; light brownish gray (2.5Y 6/2) loamy very fine sand, grayish brown (2.5Y 5/2) moist; massive; soft, very friable; 6 percent calcium carbonate equivalent; common medium prominent yellowish brown (10YR 5/6) redoximorphic concentrations and common medium distinct gray (10YR 5/1) redoximorphic depletions; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 20 inches
Depth to carbonates: 0 to 16 inches
Depth to contrasting parent material: 9 to 30 inches over loamy alluvium
Depth to gypsum and other visible salts (other than carbonates): 9 to 16 inches

E horizon:
Hue—10YR
Value—5 to 7 (3 to 5 moist)
Chroma—1
Texture—silt loam

Btn horizon:
Hue—10YR or 2.5Y
Value—3 to 5 (2 or 3 moist)
Chroma—1 or 2
Texture—silty clay or silty clay loam

Bkz horizon:
Hue—10YR, 2.5Y, or 5Y
Value—5 to 7 (3 to 5 moist)
Chroma—2 to 4
Texture—silty clay loam, very fine sandy loam, loam, clay loam, or silt loam

C horizon:
Hue—10YR, 2.5Y, or 5Y
Value—6 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—clay loam, loam, or loamy very fine sand; fine sand, sandy loam, or silty clay loam in some pedons

Graceville Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderate in the silty sediments and very rapid in the underlying gravelly material
Landform: Outwash plains
Parent material: Silty alluvium or loess over glacial outwash
Slope: 0 to 2 percent

Typical Pedon

Graceville silty clay loam, 0 to 2 percent slopes, 2,650 feet south and 1,000 feet east of the northwest corner of sec. 9, T. 104 N., R. 50 W.; USGS Colton Southeast, SD, topographic quadrangle; lat. 43 degrees 49 minutes 38 seconds N. and long. 96 degrees 50 minutes 47 seconds W.

Ap—0 to 9 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; weak fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine and fine roots throughout; slightly acid; clear smooth boundary.

A—9 to 18 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; moderate medium subangular blocky structure parting to moderate medium granular; slightly hard, friable, sticky and slightly plastic; common very fine and fine roots throughout; slightly acid; gradual smooth boundary.

Bw1—18 to 30 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, very friable, sticky and slightly plastic; few very fine and fine roots throughout; common very fine tubular pores; slightly acid; clear smooth boundary.

Bw2—30 to 52 inches; light olive brown (2.5Y 5/4) silty clay loam, olive brown (2.5Y 4/3) moist; weak coarse prismatic structure parting to weak

medium subangular blocky; slightly hard, very friable, sticky and slightly plastic; many very fine tubular pores; few fine distinct olive yellow (2.5Y 6/6) redoximorphic concentrations; neutral; clear smooth boundary.

2C—52 to 80 inches; brown (10YR 4/3) gravelly sand, dark brown (10YR 3/3) moist; single grain; loose; 7 percent calcium carbonate equivalent; few discontinuous carbonate coats on sand and gravel; 20 percent subrounded mixed gravel; slightly effervescent; neutral.

Range in Characteristics

Thickness of the mollic epipedon: 20 to 48 inches
Depth to carbonates: 25 to 60 inches
Depth to contrasting parent material: 40 to 60 inches over gravelly material
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1 or 2
Texture—silty clay loam or silt loam

Bw horizon:
Hue—10YR or 2.5Y
Value—4 to 6 (2 to 4 moist)
Chroma—1 to 4
Texture—silty clay loam, silt loam, or loam

2C horizon:
Hue—10YR or 2.5Y
Value—4 to 7 (3 to 6 moist)
Chroma—2 to 4
Texture—gravelly loamy sand, gravelly sand, very gravelly loamy sand, very gravelly sand, loamy sand, or sand

Grovena Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderate
Landform: Till plains and moraines
Parent material: Loamy eolian material
Slope: 0 to 15 percent

Typical Pedon

Grovena loam (fig. 29), 2 to 6 percent slopes, 500 feet south and 65 feet east of the northwest corner of sec. 20, T. 104 N., R. 48 W.; USGS Dell Rapids, SD, topographic quadrangle; lat. 43 degrees 48 minutes 22 seconds N. and long. 96 degrees 38 minutes 02 seconds W.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; hard, friable; common very fine and fine roots throughout; slightly acid; abrupt smooth boundary.

Bw1—9 to 13 inches; brown (10YR 4/3) silt loam, dark brown (10YR 3/3) moist; weak medium and coarse prismatic structure parting to weak medium subangular blocky; hard, friable, slightly sticky and slightly plastic; common very fine and fine roots throughout; common very fine tubular pores; slightly acid; gradual wavy boundary.

Bw2—13 to 24 inches; yellowish brown (10YR 5/4) silt loam, brown (10YR 4/3) moist; weak medium and coarse prismatic structure parting to weak medium subangular blocky; hard, friable, slightly sticky and slightly plastic; common very fine and fine roots throughout; common very fine tubular pores; slightly acid; gradual wavy boundary.

Bw3—24 to 30 inches; light yellowish brown (10YR 6/4) loam, yellowish brown (10YR 5/4) moist; weak coarse prismatic structure parting to weak medium subangular blocky; hard, friable; few fine roots throughout; common very fine tubular pores; neutral; abrupt wavy boundary.

Bk—30 to 36 inches; light yellowish brown (10YR 6/4) loam, yellowish brown (10YR 5/4) moist; weak coarse prismatic structure parting to weak medium subangular blocky; hard, friable; many very fine and fine tubular pores; 7 percent calcium carbonate equivalent; few fine rounded soft masses of carbonate; strongly effervescent; moderately alkaline; clear wavy boundary.

C1—36 to 51 inches; light yellowish brown (10YR 6/4) sandy loam, yellowish brown (10YR 5/4) moist; massive; slightly hard, very friable; many very fine and fine tubular pores; 8 percent calcium carbonate equivalent; strongly effervescent; moderately alkaline; clear wavy boundary.

2C2—51 to 60 inches; light yellowish brown (10YR 6/4) clay loam, yellowish brown (10YR 5/4) moist; massive; hard, firm, slightly sticky and slightly plastic; common very fine tubular pores; 8 percent calcium carbonate equivalent; few fine rounded soft masses of carbonate; strongly effervescent; 1 percent subangular mixed gravel; moderately alkaline; gradual wavy boundary.

2C3—60 to 80 inches; very pale brown (10YR 7/4) clay loam, yellowish brown (10YR 5/4) moist; massive; very hard, very firm, sticky and plastic; few very fine tubular pores; 9 percent calcium

carbonate equivalent; few fine rounded soft masses of carbonate; 3 percent subangular mixed gravel; common fine and medium prominent strong brown (7.5YR 5/6) redoximorphic concentrations; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 8 to 20 inches
Depth to carbonates: 30 to 48 inches
Depth to contrasting parent material: More than 40 inches over loamy glacial till or sandy material
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches
Other features: Some pedons do not have a 2C horizon.

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1 or 2
Texture—loam or silt loam

Bw horizon:
Hue—10YR or 2.5Y
Value—4 to 6 (3 to 5 moist)
Chroma—2 to 4
Texture—loam or silt loam

Bk horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—loam or silt loam

C horizon:
Hue—10YR or 2.5Y
Value—5 to 8 (4 to 6 moist)
Chroma—2 to 4
Texture—loam, sandy loam, fine sandy loam, or silt loam

2C horizon:
Hue—2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—clay loam or loam

Henkin Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderately rapid
Landform: Outwash plains
Parent material: Loamy glaciofluvial sediments
Slope: 2 to 9 percent

Typical Pedon

Henkin fine sandy loam, in an area of Blendon-Henkin fine sandy loams, 2 to 6 percent slopes, 2,440 feet north and 1,600 feet west of the southeast corner of sec. 27, T. 104 N., R. 48 W.; USGS Dell Rapids Southeast, SD, topographic quadrangle; lat. 44 degrees 46 minutes 56 seconds N. and long. 96 degrees 34 minutes 39 seconds W.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) fine sandy loam, black (10YR 2/1) moist; weak medium granular structure; slightly hard, very friable; many very fine and fine roots throughout; common very fine and fine vesicular and tubular pores; neutral; clear smooth boundary.

Bw1—9 to 16 inches; brown (10YR 5/3) fine sandy loam, brown (10YR 4/3) moist; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, very friable; common very fine roots throughout; common very fine and fine tubular pores; common krotovinas; very few prominent discontinuous black (10YR 2/1) coats on faces of peds; neutral; gradual smooth boundary.

Bw2—16 to 25 inches; brown (10YR 5/3) fine sandy loam, brown (10YR 4/3) moist; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, very friable; common very fine roots throughout; common very fine and fine tubular pores; common krotovinas; neutral; gradual smooth boundary.

Bk—25 to 46 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 5/3) moist; weak medium prismatic structure parting to weak fine subangular blocky; slightly hard, very friable; common very fine roots throughout; common very fine tubular pores; 11 percent calcium carbonate equivalent; common fine and medium rounded soft masses of carbonate and few fine and medium rounded carbonate concretions; violently effervescent; moderately alkaline; diffuse smooth boundary.

C1—46 to 59 inches; light yellowish brown (2.5Y 6/3) fine sandy loam, olive brown (2.5Y 4/3) moist; massive; slightly hard, very friable; common very fine roots throughout; 9 percent calcium carbonate equivalent; few fine and medium rounded soft masses of carbonate; violently effervescent; moderately alkaline; gradual smooth boundary.

C2—59 to 71 inches; light yellowish brown (2.5Y 6/3) fine sandy loam, olive brown (2.5Y 4/3) moist; massive; slightly hard, very friable; common very fine roots throughout; 11 percent calcium carbonate equivalent; few medium rounded soft

masses of carbonate; common fine and medium distinct gray (2.5Y 5/1) relict redoximorphic features; violently effervescent; moderately alkaline; gradual smooth boundary.

C3—71 to 80 inches; light yellowish brown (2.5Y 6/3) fine sandy loam, olive brown (2.5Y 4/3) moist; massive; slightly hard, very friable; 8 percent calcium carbonate equivalent; common medium prominent strong brown (7.5YR 4/6) and common fine and medium distinct gray (2.5Y 5/1) relict redoximorphic features; violently effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 20 inches
Depth to carbonates: 18 to 60 inches
Depth to contrasting parent material: More than 40 inches over loamy glacial till or gravelly material
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1 or 2
Texture—fine sandy loam, sandy loam, or loam

Bw horizon:
Hue—10YR or 2.5Y
Value—4 to 6 (3 to 5 moist)
Chroma—2 or 3
Texture—fine sandy loam, sandy loam, or loam

Bk horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—fine sandy loam, loam, or sandy loam stratified with fine sand or loamy sand

C horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—fine sandy loam, loamy fine sand, loam, clay loam, very gravelly loamy sand, or gravelly loamy sand

Houdek Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderately slow
Landform: Till plains and moraines
Parent material: Loamy glacial till
Slope: 2 to 25 percent

Typical Pedon

Houdek clay loam (fig. 30), in an area of Shindler-Houdek clay loams, 15 to 40 percent slopes, 600 feet north and 50 feet west of the southeast corner of sec. 18, T. 103 N., R. 49 W.; USGS Crooks, SD, topographic quadrangle; lat. 43 degrees 43 minutes 09 seconds N. and long. 96 degrees 45 minutes 04 seconds W.

A—0 to 6 inches; dark gray (10YR 4/1) clay loam, black (10YR 2/1) moist; moderate fine and medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots throughout; neutral; clear smooth boundary.

Bt—6 to 17 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots throughout; common very fine tubular pores; few continuous clay films on faces of peds; 1 percent subangular and subrounded mixed gravel; neutral; clear wavy boundary.

Bk1—17 to 22 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; moderate medium prismatic structure parting to weak fine and medium subangular blocky; hard, friable, slightly sticky and slightly plastic; common very fine to medium roots throughout; common very fine tubular pores; 9 percent calcium carbonate equivalent; few fine and medium irregular soft masses of carbonate; 1 percent subangular and subrounded mixed gravel; strongly effervescent; slightly alkaline; clear smooth boundary.

Bk2—22 to 33 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; weak medium prismatic structure parting to weak fine subangular blocky; hard, friable, slightly sticky and slightly plastic; common very fine and fine roots throughout; few very fine tubular pores; 11 percent calcium carbonate equivalent; common medium irregular soft masses of carbonate; 1 percent subangular mixed gravel; common fine and medium prominent gray (10YR 5/1) relict redoximorphic features; strongly effervescent; moderately alkaline; gradual smooth boundary.

C1—33 to 48 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; massive; hard, friable, slightly sticky and slightly plastic; few very fine and fine roots throughout; few very fine tubular pores; 9 percent calcium

carbonate equivalent; common medium irregular soft masses of carbonate; 2 percent subangular mixed gravel; few fine and medium prominent yellowish brown (10YR 5/8) redoximorphic concentrations and common fine and medium prominent gray (10YR 6/1) redoximorphic depletions; strongly effervescent; moderately alkaline; gradual smooth boundary.

C2—48 to 71 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; massive; hard, friable, slightly sticky and slightly plastic; few very fine and fine roots throughout; 9 percent calcium carbonate equivalent; very few patchy black (10YR 2/1) manganese or iron-manganese stains throughout; few fine irregular soft masses of carbonate; 2 percent subangular mixed gravel; common fine and medium prominent yellowish brown (10YR 5/8) redoximorphic concentrations and common fine and medium prominent gray (10YR 5/1) redoximorphic depletions; strongly effervescent; moderately alkaline; gradual smooth boundary.

C3—71 to 80 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; massive; hard, friable, slightly sticky and slightly plastic; few 2-inch lenses of stratified sand; 11 percent calcium carbonate equivalent; very few patchy black (10YR 2/1) manganese or iron-manganese stains throughout and very few patchy carbonate coats on rock fragments; few fine irregular soft masses of carbonate; 2 percent subangular mixed gravel; common medium prominent strong brown (7.5YR 5/8) and common fine and medium prominent gray (10YR 6/1) redoximorphic depletions; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 8 to 20 inches
Depth to carbonates: 14 to 24 inches
Depth to contrasting parent material: More than 60 inches
Depth to gypsum and other visible salts (other than carbonates): More than 40 inches

A horizon:
Hue—10YR
Value—3 to 5 (2 or 3 moist)
Chroma—1 or 2
Texture—clay loam, loam, or silt loam

Bt horizon:
Hue—10YR or 2.5Y
Value—4 to 6 (3 to 5 moist)
Chroma—2 or 3
Texture—clay loam

Bk horizon:
Hue—10YR or 2.5Y
Value—4 to 6 (4 or 5 moist)
Chroma—2 to 4
Texture—clay loam or loam

C horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—clay loam or loam

Huntimer Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Slow
Landform: Ice-walled lake plains
Parent material: Clayey glaciolacustrine sediments
Slope: 0 to 6 percent

Typical Pedon

Huntimer silty clay loam (fig. 31), 0 to 2 percent slopes, 192 feet south and 415 feet west of the northeast corner of sec. 19, T. 104 N., R. 52 W.; USGS Buffalo Trading Post, SD, topographic quadrangle; lat. 43 degrees 48 minutes 16 seconds N. and long. 97 degrees 06 minutes 39 seconds W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark gray (10YR 3/1) moist; moderate fine angular blocky structure parting to weak fine granular; very hard, friable, slightly sticky and slightly plastic; common very fine to medium roots throughout; common medium vesicular pores; neutral; clear smooth boundary.

Bw1—7 to 12 inches; dark grayish brown (10YR 4/2) silty clay, very dark gray (10YR 3/1) moist; moderate medium prismatic structure parting to moderate fine subangular blocky; hard, firm, sticky and plastic; common very fine to medium roots throughout; common medium tubular pores; few discontinuous pressure faces; neutral; clear wavy boundary.

Bw2—12 to 18 inches; brown (10YR 5/3) silty clay, dark grayish brown (10YR 4/2) moist; moderate medium prismatic structure parting to moderate fine subangular blocky; hard, firm, sticky and plastic; common very fine to medium roots throughout; common very fine tubular pores; few distinct discontinuous black (10YR 2/1) coats on

vertical faces of peds and few discontinuous pressure faces; neutral; clear irregular boundary.

Bk1—18 to 26 inches; light olive brown (2.5Y 5/3) silty clay loam, olive brown (2.5Y 4/3) moist; moderate medium prismatic structure parting to moderate fine subangular blocky; hard, firm, slightly sticky and slightly plastic; few very fine and fine roots throughout; common very fine tubular pores; 6 percent calcium carbonate equivalent; very few distinct discontinuous very dark grayish brown (10YR 3/2) coats on vertical faces of peds; common medium and coarse rounded soft masses of carbonate and few fine rounded carbonate concretions; few fine faint gray (10YR 6/1) and common fine and medium prominent strong brown (7.5YR 4/6) relict redoximorphic features; strongly effervescent; slightly alkaline; gradual wavy boundary.

Bk2—26 to 38 inches; light yellowish brown (2.5Y 6/3) silty clay loam, light olive brown (2.5Y 5/3) moist; moderate medium prismatic structure parting to moderate fine angular blocky; hard, firm, slightly sticky and slightly plastic; few fine roots throughout; common very fine tubular pores; 8 percent calcium carbonate equivalent; common medium and coarse rounded soft masses of carbonate and few fine rounded carbonate concretions; common fine and medium prominent brown (7.5YR 4/4) and common fine and medium gray (10YR 5/1) relict redoximorphic features; strongly effervescent; moderately alkaline; gradual wavy boundary.

C1—38 to 50 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; moderate medium angular blocky structure; very hard, firm, slightly sticky and slightly plastic; common very fine tubular pores; varved; 8 percent calcium carbonate equivalent; very few prominent discontinuous black (10YR 2/1) manganese or iron-manganese stains; common fine and medium rounded soft masses of carbonate; common fine and medium prominent strong brown (7.5YR 4/6) redoximorphic concentrations and common medium distinct gray (10YR 5/1) redoximorphic deletions; strongly effervescent; moderately alkaline; gradual wavy boundary.

C2—50 to 60 inches; light gray (2.5Y 7/1) silty clay loam, gray (2.5Y 5/1) moist; massive; very hard, firm, slightly sticky and slightly plastic; common very fine tubular pores; varved; 8 percent calcium carbonate equivalent; very few prominent patchy very dark brown (10YR 2/2) manganese or iron-manganese stains; common fine and medium rounded soft masses of carbonate and few coarse cylindrical iron concretions; common fine and medium prominent strong brown (7.5YR 4/6) redoximorphic concentrations and common medium faint gray (10YR 5/1) redoximorphic depletions; strongly effervescent; moderately alkaline; gradual smooth boundary.

C3—60 to 80 inches; light gray (2.5Y 7/2) silty clay loam, grayish brown (2.5Y 5/2) moist; massive; very hard, firm, slightly sticky and slightly plastic; common very fine and fine tubular pores; varves of silt loam and fine sand; 7 percent calcium carbonate equivalent; few prominent continuous dark brown (7.5YR 3/4) iron stains in root channels and/or pores; common coarse cylindrical iron concretions; 1 percent subrounded mixed gravel; common fine and medium prominent strong brown (7.5YR 4/6) and common fine and medium prominent dark brown (7.5YR 3/4) redoximorphic concentrations and many fine and coarse faint gray (2.5Y 6/1) redoximorphic concentrations; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 10 to 20 inches
Depth to carbonates: 14 to 28 inches
Depth to contrasting parent material: More than 40 inches over loamy glacial till
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1 or 2
Texture—silty clay loam or silty clay

Bw horizon:
Hue—10YR or 2.5Y
Value—3 to 5 (2 to 4 moist)
Chroma—1 to 3
Texture—silty clay or silty clay loam

Bk horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 or 5 moist)
Chroma—2 to 4
Texture—silty clay or silty clay loam

C horizon:
Hue—2.5Y or 5Y
Value—5 to 7 (4 or 5 moist)
Chroma—1 to 4
Texture—silty clay loam or silt loam

Ihlen Series

Depth to bedrock: Moderately deep
Drainage class: Well drained
Permeability: Moderate in the loess and very slow in the underlying Sioux quartzite
Landform: Dissected plains
Parent material: Loess over bedrock
Slope: 0 to 25 percent

Typical Pedon

Ihlen silty clay loam (fig. 32), 0 to 2 percent slopes, 1,800 feet south and 500 feet west of the northeast corner of sec. 16, T. 104 N., R. 49 W.; USGS Dell Rapids, SD, topographic quadrangle; lat. 43 degrees 48 minutes 50 seconds N. and long. 96 degrees 42 minutes 31 seconds W.

Ap—0 to 11 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; weak fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine and fine roots throughout; common very fine and fine vesicular and tubular pores; slightly acid; clear smooth boundary.

Bw1—11 to 17 inches; grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to weak fine subangular blocky; hard, very friable, slightly sticky and slightly plastic; common very fine and fine roots throughout; common very fine to medium tubular pores; few faint discontinuous black (10YR 2/1) coats in root channels and pores; slightly acid; clear smooth boundary.

Bw2—17 to 25 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 4/3) moist; weak medium prismatic structure parting to weak fine subangular blocky; hard, very friable, slightly sticky and slightly plastic; common very fine and fine roots throughout; common very fine and fine tubular pores; slightly acid; gradual smooth boundary.

BC—25 to 35 inches; light yellowish brown (2.5Y 6/4) silt loam, olive brown (2.5Y 4/3) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; common very fine and fine roots throughout; common very fine and fine tubular pores; 1 percent calcium carbonate equivalent; very few prominent discontinuous yellowish brown (10YR 5/6) iron stains in root channels and/or pores; common fine prominent gray (10YR 5/1) relict redoximorphic features; very slightly effervescent; neutral; abrupt irregular boundary.

R—35 inches; reddish brown (2.5YR 5/4), unweathered Sioux quartzite.

Range in Characteristics

Thickness of the mollic epipedon: 10 to 20 inches
Depth to carbonates: More than 28 inches
Depth to contrasting parent material: 20 to 40 inches over unweathered Sioux quartzite
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches
Other features: Some pedons have a C horizon.

A horizon:
Hue—10YR
Value—2 to 4 (2 or 3 moist)
Chroma—1 or 2
Texture—silty clay loam or silt loam

Bw horizon:
Hue—10YR
Value—4 to 6 (3 or 4 moist)
Chroma—2 to 4
Texture—silty clay loam or silt loam

R layer:
Hue—2.5YR
Value—5 or 6 (4 or 5 moist)
Chroma—2 to 4
Type of bedrock—Sioux quartzite

Janude Series

Depth to bedrock: Very deep
Drainage class: Moderately well drained
Permeability: Moderate
Landform: Flood plains
Parent material: Loamy alluvium
Slope: 0 to 2 percent

Typical Pedon

Janude fine sandy loam (fig. 33), 0 to 2 percent slopes, 100 feet south and 1,940 feet west of the northeast corner of sec. 29, T. 104 N., R. 49 W.; USGS Dell Rapids, SD, topographic quadrangle; lat. 43 degrees 47 minutes 25 seconds N. and long. 96 degrees 44 minutes 10 seconds W.

Ap—0 to 8 inches; dark gray (10YR 4/1) fine sandy loam, black (10YR 2/1) moist; weak fine subangular blocky structure parting to weak fine granular; soft, very friable; common very fine and fine roots throughout; neutral; clear smooth boundary.

A—8 to 19 inches; dark gray (10YR 4/1) fine sandy loam, black (10YR 2/1) moist; weak coarse prismatic structure parting to weak medium and coarse subangular blocky; soft, very friable;

common very fine and fine roots throughout; neutral; gradual wavy boundary.

AC—19 to 43 inches; dark grayish brown (10YR 4/2) fine sandy loam, black (10YR 2/1) moist; weak coarse prismatic structure parting to weak medium and coarse subangular blocky; soft, very friable; common very fine and fine roots throughout; common very fine tubular pores; 6 percent calcium carbonate equivalent; slightly effervescent; neutral; clear wavy boundary.

C1—43 to 57 inches; grayish brown (10YR 5/2) fine sandy loam, dark brown (10YR 3/3) moist; massive; soft, very friable; few very fine and fine roots throughout; common very fine tubular pores; 6 percent calcium carbonate equivalent; slightly effervescent; slightly alkaline; gradual wavy boundary.

C2—57 to 80 inches; grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine tubular pores; 6 percent calcium carbonate equivalent; common fine prominent yellowish brown (10YR 5/8) redoximorphic concentrations; slightly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: More than 27 inches
Depth to carbonates: 14 to 30 inches
Depth to contrasting parent material: More than 40 inches over loamy glacial till
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches

A horizon:
Hue—10YR
Value—4 or 5 (2 or 3 moist)
Chroma—1 or 2
Texture—fine sandy loam, sandy loam, or loam

C horizon:
Hue—10YR
Value—5 to 7 (3 to 5 moist)
Chroma—1 to 3
Texture—fine sandy loam, silty clay loam, loam, or clay loam

Lamo Series

Depth to bedrock: Very deep
Drainage class: Somewhat poorly drained
Permeability: Moderately slow
Landform: Flood plains
Parent material: Silty alluvium
Slope: 0 to 1 percent

Typical Pedon

Lamo silty clay loam, channeled, 170 feet south and 1,400 feet west of the northeast corner of sec. 20, T. 102 N., R. 50 W.; USGS Crooks, SD, topographic quadrangle; lat. 43 degrees 37 minutes 49 seconds N. and long. 96 degrees 51 minutes 21 seconds W.

A1—0 to 7 inches; gray (10YR 5/1) silty clay loam, black (10YR 2/1) moist; weak fine and medium granular structure; hard, friable, slightly sticky and slightly plastic; many very fine to medium roots throughout; slightly alkaline; clear smooth boundary.

A2—7 to 17 inches; grayish brown (10YR 5/2) silt loam, very dark gray (10YR 3/1) moist; weak thin platy structure parting to weak fine granular; hard, friable, slightly sticky and slightly plastic; many very fine to medium roots throughout; few very fine vesicular and tubular pores; 6 percent calcium carbonate equivalent; slightly effervescent; slightly alkaline; clear smooth boundary.

A3—17 to 30 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; weak fine subangular blocky structure parting to weak fine granular; hard, friable, slightly sticky and slightly plastic; common very fine roots throughout; common very fine vesicular and tubular pores; 7 percent calcium carbonate equivalent; strongly effervescent; slightly alkaline; clear smooth boundary.

AB—30 to 43 inches; dark gray (10YR 4/1) silty clay loam, very dark gray (10YR 3/1) moist; weak medium subangular blocky structure parting to weak fine granular; hard, friable, slightly sticky and slightly plastic; common very fine roots throughout; common very fine and fine vesicular and tubular pores; 7 percent calcium carbonate equivalent; few fine rounded soft masses of carbonate; strongly effervescent; moderately alkaline; gradual smooth boundary.

Bg—43 to 64 inches; light gray (10YR 7/1) silty clay loam, light brownish gray (2.5Y 6/2) moist; weak fine and medium subangular blocky structure; very hard, friable, slightly sticky and slightly plastic; common very fine and fine tubular pores; 6 percent calcium carbonate equivalent; common fine rounded soft masses of carbonate; few fine prominent yellowish brown (10YR 5/8) redoximorphic concentrations; strongly effervescent; moderately alkaline; gradual smooth boundary.

Cg—64 to 80 inches; light gray (10YR 7/1) silty clay loam, gray (2.5Y 6/1) moist; massive; very hard, friable, slightly sticky and slightly plastic; common

very fine tubular pores; few thin strata of fine sandy loam and very fine sandy loam; 6 percent calcium carbonate equivalent; common fine rounded soft masses of carbonate; common fine and medium prominent yellowish brown (10YR 5/6) redoximorphic concentrations; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 24 to 45 inches
Depth to carbonates: 0 to 10 inches
Depth to contrasting parent material: More than 60 inches
Depth to gypsum and other visible salts (other than carbonates): More than 30 inches

A horizon:
Hue—10YR or 2.5Y
Value—3 to 5 (2 or 3 moist)
Chroma—1 or 2
Texture—silty clay loam, silt loam, or loam

AB horizon:
Hue—10YR or 2.5Y
Value—4 or 5 (2 or 3 moist)
Chroma—1 or 2
Texture—silt loam or silty clay loam

Bg horizon:
Hue—10YR, 2.5Y, or 5Y
Value—5 to 7 (3 to 6 moist)
Chroma—1 or 2
Texture—silty clay loam, silt loam, clay loam, or silty clay

Cg horizon:
Hue—10YR, 2.5Y, or 5Y
Value—5 to 7 (3 to 6 moist)
Chroma—1 or 2
Texture—silty clay loam, silt loam, clay loam, or silty clay

Moody Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderate
Landform: Plains
Parent material: Loess
Slope: 0 to 9 percent

Typical Pedon

Moody silty clay loam (fig. 34), in an area of Moody-Nora silty clay loams, 2 to 6 percent slopes, 2,400 feet south and 88 feet east of the northwest corner of sec. 2, T. 103 N., R. 50 W.; USGS Colton Southeast, SD, topographic quadrangle; lat. 43 degrees 45 minutes 16 seconds N. and long. 96 degrees 48 minutes 37 seconds W.

Ap—0 to 11 inches; very dark grayish brown (10YR 3/2) silty clay loam, very dark brown (10YR 2/2) moist; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots throughout; neutral; abrupt smooth boundary.

Bw1—11 to 24 inches; brown (10YR 5/3) silty clay loam, dark grayish brown (10YR 4/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky; hard, friable, slightly sticky and slightly plastic; common very fine and fine roots throughout; common very fine to medium tubular pores; neutral; clear wavy boundary.

Bw2—24 to 35 inches; light olive brown (2.5Y 5/3) silty clay loam, olive brown (2.5Y 4/3) moist; weak medium prismatic structure parting to moderate medium subangular blocky; hard, friable, slightly sticky and slightly plastic; few very fine and fine roots throughout; few very fine tubular pores; neutral; abrupt wavy boundary.

Bk—35 to 50 inches; light yellowish brown (2.5Y 6/4) silt loam, light olive brown (2.5Y 5/4) moist; weak coarse prismatic structure parting to weak medium and coarse subangular blocky; hard, friable, slightly sticky and slightly plastic; few very fine and fine roots throughout; few very fine tubular pores; 7 percent calcium carbonate equivalent; common fine irregular soft masses of carbonate; few fine distinct gray (2.5Y 6/1) relict redoximorphic features; strongly effervescent; slightly alkaline; diffuse wavy boundary.

C1—50 to 62 inches; light yellowish brown (2.5Y 6/4) silt loam, light olive brown (2.5Y 5/4) moist; massive; hard, friable, slightly sticky and slightly plastic; few very fine tubular pores; 5 percent calcium carbonate equivalent; few fine irregular soft masses of carbonate; common fine distinct gray (2.5Y 6/1) redoximorphic depletions; strongly effervescent; moderately alkaline; gradual wavy boundary.

C2—62 to 80 inches; light yellowish brown (2.5Y 6/4) silt loam, light olive brown (2.5Y 5/4) moist; massive; slightly hard, friable; few very fine tubular pores; 5 percent calcium carbonate equivalent; common fine rounded soft masses of iron-manganese and few fine rounded soft masses of carbonate; common fine distinct gray (2.5Y 6/1) redoximorphic depletions; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 10 to 20 inches
Depth to carbonates: More than 30 inches
Depth to contrasting parent material: More than 40 inches over loamy glacial till or sandy material
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—2
Texture—silty clay loam, silt loam, or loam

Bw horizon:
Hue—10YR or 2.5Y
Value—4 to 6 (3 to 5 moist)
Chroma—2 to 4
Texture—silty clay loam or silt loam

Bk horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—silt loam or silty clay loam

C horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—silt loam or silty clay loam

Nora Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderate
Landform: Plains and dissected plains
Parent material: Loess
Slope: 2 to 25 percent

Typical Pedon

Nora silty clay loam (fig. 35), in an area of Nora-Crofton complex, 6 to 9 percent slopes, 1,890 feet south and 120 feet west of the northeast corner of sec. 35, T. 104 N., R. 50 W.; USGS Colton Southeast, SD, topographic quadrangle; lat. 43 degrees 47 minutes 06 seconds N. and long. 96 degrees 46 minutes 16 seconds W.

Ap—0 to 9 inches; grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure parting to weak fine granular; slightly hard, very friable, slightly sticky and slightly plastic; common very fine roots throughout; common very fine and fine tubular pores; few wormcasts; slightly acid; abrupt smooth boundary.

Bw—9 to 22 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 4/3) moist; weak medium and coarse prismatic structure parting to weak medium and coarse subangular blocky; slightly hard, very friable, slightly sticky and slightly plastic; common very fine to medium roots throughout; common very fine tubular pores; few wormcasts; neutral; abrupt wavy boundary.

Bk1—22 to 32 inches; pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; weak coarse prismatic structure parting to weak medium and coarse subangular blocky; soft, very friable, slightly sticky and slightly plastic; common very fine and fine roots throughout; many very fine tubular pores; 8 percent calcium carbonate equivalent; common fine and medium rounded soft masses of carbonate and few medium rounded carbonate concretions; strongly effervescent; slightly alkaline; clear wavy boundary.

Bk2—32 to 54 inches; pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; weak coarse prismatic structure parting to weak medium subangular blocky; soft, very friable, slightly sticky and slightly plastic; common very fine roots throughout; many very fine tubular pores; 7 percent calcium carbonate equivalent; common fine and medium rounded soft masses of carbonate and few fine and medium rounded carbonate concretions; common fine and medium prominent strong brown (7.5YR 4/6) and common fine and medium faint gray (10YR 5/1) relict redoximorphic features; strongly effervescent; slightly alkaline; gradual wavy boundary.

C—54 to 80 inches; light yellowish brown (2.5Y 6/3) silt loam, light olive brown (2.5Y 5/3) moist; massive; soft, very friable, slightly sticky and slightly plastic; many very fine tubular pores; 6 percent calcium carbonate equivalent; few calcium carbonate threads; common fine and medium prominent strong brown (7.5YR 5/8) redoximorphic concentrations and common fine and medium faint gray (10YR 5/1) redoximorphic depletions; strongly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 20 inches
Depth to carbonates: 13 to 30 inches
Depth to contrasting parent material: More than 40 inches over loamy glacial till or sandy material
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches

A horizon:
Hue—10YR
Value—3 to 5 (2 or 3 moist)
Chroma—2
Texture—silty clay loam or silt loam

Bw horizon:
Hue—10YR or 2.5Y
Value—5 or 6 (3 or 4 moist)
Chroma—3 or 4
Texture—silty clay loam or silt loam

Bk horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—3 or 4
Texture—silt loam or silty clay loam

C horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—silt loam, very fine sandy loam, or silty clay loam

Obert Series

Depth to bedrock: Very deep
Drainage class: Very poorly drained
Permeability: Moderately slow
Landform: Flood plains
Parent material: Loamy alluvium
Slope: 0 to 1 percent

Typical Pedon

Obert silty clay loam, 0 to 1 percent slopes, 400 feet north and 1,850 feet west of the southeast corner of sec. 7, T. 103 N., R. 48 W.; USGS Renner, SD, topographic quadrangle; lat. 43 degrees 44 minutes 00 seconds N. and long. 96 degrees 38 minutes 18 seconds W.

A1—0 to 6 inches; gray (10YR 5/1) silty clay loam, black (10YR 2/1) moist; weak medium granular structure; hard, friable, slightly sticky and slightly plastic; many very fine to medium roots throughout; common very fine and fine vesicular and tubular pores; 8 percent calcium carbonate equivalent; strongly effervescent; slightly alkaline; clear smooth boundary.

A2—6 to 13 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; weak medium angular blocky structure parting to weak fine granular; hard, friable, slightly sticky and slightly plastic; many very fine to medium roots throughout; common very fine and fine vesicular and tubular pores; 7 percent calcium carbonate equivalent; common fine prominent strong brown (7.5YR 4/6) redoximorphic concentrations; strongly effervescent; slightly alkaline; gradual smooth boundary.

A3—13 to 26 inches; dark gray (10YR 4/1) silty clay loam, very dark gray (10YR 3/1) moist; weak medium subangular blocky structure parting to weak fine granular; hard, friable, slightly sticky and slightly plastic; many very fine to medium roots throughout; common very fine tubular pores; 7 percent calcium carbonate equivalent; common medium prominent strong brown (7.5YR 4/6) redoximorphic concentrations; strongly effervescent; slightly alkaline; gradual smooth boundary.

A4—26 to 40 inches; dark gray (2.5Y 4/1) silty clay loam, black (2.5Y 2/1) moist; weak fine granular structure; hard, friable, slightly sticky and slightly plastic; common very fine roots throughout; common very fine tubular pores; few snail shells; 8 percent calcium carbonate equivalent; strongly effervescent; slightly alkaline; gradual smooth boundary.

ACg—40 to 52 inches; gray (2.5Y 5/1) silty clay loam, very dark gray (2.5Y 3/1) moist; weak fine subangular blocky structure parting to weak fine granular; hard, friable, slightly sticky and slightly plastic; few very fine roots throughout; common very fine tubular pores; 7 percent calcium carbonate equivalent; strongly effervescent; slightly alkaline; gradual smooth boundary.

Cg1—52 to 65 inches; gray (5Y 6/1) silty clay loam, olive gray (5Y 4/2) moist; massive; hard, friable, slightly sticky and slightly plastic; common very fine tubular pores; few strata of fine sand; 6 percent calcium carbonate equivalent; few fine prominent olive yellow (2.5Y 6/6) redoximorphic concentrations and few fine distinct gray (2.5Y 5/1) redoximorphic depletions; slightly effervescent; slightly alkaline; gradual smooth boundary.

Cg2—65 to 80 inches; gray (5Y 6/1) silty clay loam, olive gray (5Y 4/2) moist; massive; hard, friable, slightly sticky and slightly plastic; common very fine tubular pores; few strata of sand and gravel; few soft masses of carbonate in the gravel layer; 5 percent calcium carbonate equivalent; very few faint patchy black (10YR 2/1) manganese or iron-manganese stains; few fine prominent olive yellow (2.5Y 6/6) redoximorphic concentrations and few

fine distinct gray (2.5Y 5/1) redoximorphic depletions; slightly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: More than 24 inches
Depth to carbonates: 0 to 10 inches
Depth to contrasting parent material: More than 60 inches
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches

A horizon:
Hue—10YR or 2.5Y
Value—3 to 5 (2 or 3 moist)
Chroma—1 or 2
Texture—silty clay loam or silt loam

ACg horizon:
Hue—10YR or 2.5Y
Value—3 to 5 (2 to 4 moist)
Chroma—1 or 2
Texture—silty clay loam or silt loam

Cg horizon:
Hue—2.5Y or 5Y
Value—4 to 7 (3 to 6 moist)
Chroma—1 or 2
Texture—silty clay loam, silt loam, or loam

Salmo Series

Depth to bedrock: Very deep
Drainage class: Poorly drained
Permeability: Moderately slow in the silty alluvium and moderately rapid in the underlying loamy sediments
Landform: Flood plains
Parent material: Silty alluvium
Slope: 0 to 1 percent

Typical Pedon

Salmo silty clay loam, 0 to 1 percent slopes, 1,536 feet north and 935 feet west of the southeast corner of sec. 21, T. 102 N., R. 51 W.; USGS Hartford South, SD, topographic quadrangle; lat. 43 degrees 37 minutes 13 seconds N. and long. 96 degrees 57 minutes 12 seconds W.

Az—0 to 5 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; weak medium subangular blocky structure parting to moderate medium granular; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots throughout; few fine tubular pores; 7 percent calcium carbonate equivalent; common fine and medium salt masses; few fine distinct dark yellowish brown (10YR 3/4) redoximorphic concentrations; strongly effervescent; slightly alkaline; abrupt smooth boundary.

Bz—5 to 17 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; weak medium prismatic structure parting to weak fine and medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots throughout; common very fine and fine tubular pores; 3 percent calcium carbonate equivalent; common fine salt masses; few fine distinct dark yellowish brown (10YR 3/4) redoximorphic concentrations; strongly effervescent; slightly alkaline; abrupt wavy boundary.

Bkzyg1—17 to 28 inches; dark gray (2.5Y 4/1) silty clay loam, very dark gray (2.5Y 3/1) moist; weak medium prismatic structure parting to weak fine and medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots throughout; common very fine tubular pores; 3 percent calcium carbonate equivalent; common fine salt masses, common fine nests of gypsum, and few fine rounded soft masses of carbonate; few fine prominent dark yellowish brown (10YR 3/4) redoximorphic concentrations; strongly effervescent; slightly alkaline; clear wavy boundary.

Bkzyg2—28 to 41 inches; dark gray (2.5Y 4/1) silty clay loam, very dark gray (2.5Y 3/1) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few very fine and fine roots throughout; common very fine tubular pores; 8 percent calcium carbonate equivalent; few fine salt masses, many fine and medium nests of gypsum, and few fine rounded soft masses of carbonate; few fine prominent dark yellowish brown (10YR 3/4) redoximorphic concentrations; strongly effervescent; slightly alkaline; clear wavy boundary.

Byg—41 to 49 inches; dark gray (2.5Y 4/1) clay loam, very dark gray (2.5Y 3/1) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots throughout; common very fine and fine tubular pores; few thin strata of fine sand; 7 percent calcium carbonate equivalent; many fine and medium nests of gypsum; common fine and medium prominent dark brown (10YR 3/3) and few fine prominent dark yellowish brown (10YR 3/6) redoximorphic concentrations; 1 percent

subrounded mixed gravel; strongly effervescent; slightly alkaline; clear wavy boundary.

Cg1—49 to 59 inches; light brownish gray (2.5Y 6/2) sandy loam, dark gray (2.5Y 4/1) moist; massive; soft, very friable, slightly sticky and slightly plastic; common very fine and fine tubular pores; few thin strata of silty clay loam; 7 percent calcium carbonate equivalent; very few distinct discontinuous black (10YR 2/1) manganese or iron-manganese stains; common coarse prominent strong brown (7.5YR 4/6) redoximorphic concentrations and common coarse faint grayish brown (2.5Y 5/2) redoximorphic depletions; slightly effervescent; slightly alkaline; gradual wavy boundary.

Cg2—59 to 80 inches; grayish brown (2.5Y 5/2) sandy loam, very dark grayish brown (2.5Y 3/2) moist; massive; soft, very friable, slightly sticky and slightly plastic; common very fine and fine tubular pores; few thin strata of silty clay loam; 7 percent calcium carbonate equivalent; common coarse prominent strong brown (7.5YR 4/6) redoximorphic concentrations and many coarse distinct grayish brown (2.5Y 5/2) redoximorphic depletions; 2 percent subrounded mixed gravel; slightly effervescent; neutral.

Range in Characteristics

Thickness of the mollic epipedon: More than 24 inches

Carbonates: At the surface

Depth to contrasting parent material: More than 40 inches over gravelly material

Gypsum and other visible salts (other than carbonates): At the surface

A horizon:
Hue—10YR or 2.5Y
Value—3 or 4 (2 or 3 moist)
Chroma—1
Texture—silty clay loam or silt loam

Bz or Bkzyg horizon:
Hue—10YR, 2.5Y, or 5Y
Value—3 to 5 (2 to 4 moist)
Chroma—1 or 2
Texture—silty clay loam or silt loam

Cg horizon:
Hue—2.5Y, 5Y, or N
Value—3 to 6 (2 to 4 moist)
Chroma—0 to 2
Texture—sandy loam, loam, clay loam, silt loam, or silty clay loam

Shindler Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderately slow
Landform: Moraines and dissected plains
Parent material: Loamy glacial till
Slope: 6 to 40 percent

Typical Pedon

Shindler clay loam (fig. 36), in an area of Crofton-Shindler complex, 9 to 15 percent slopes, 730 feet north and 68 feet east of the southwest corner of sec. 18, T. 103 N., R. 50 W.; USGS Hartford North, SD, topographic quadrangle; lat. 43 degrees 43 minutes 12 seconds N. and long. 96 degrees 53 minutes 23 seconds W.

Ap—0 to 8 inches; dark gray (10YR 4/1) clay loam, black (10YR 2/1) moist; weak fine granular structure; soft, friable, slightly sticky and slightly plastic; common very fine and fine roots throughout; common very fine vesicular and tubular pores; 7 percent calcium carbonate equivalent; 2 percent subangular and subrounded mixed gravel; strongly effervescent; slightly alkaline; abrupt smooth boundary.

Bw—8 to 14 inches; gray (10YR 5/1) and light yellowish brown (2.5Y 6/3) clay loam, dark grayish brown (10YR 4/2) and light olive brown (2.5Y 5/3) moist; weak coarse prismatic structure parting to weak fine and medium subangular blocky; soft, firm, sticky and plastic; common very fine and fine roots throughout; common fine tubular pores; 13 percent calcium carbonate equivalent; very few carbonate coats in root channels and pores in the lower part; 3 percent subangular and subrounded mixed gravel; strongly effervescent; slightly alkaline; clear wavy boundary.

Bk1—14 to 21 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; weak coarse prismatic structure parting to weak fine and medium subangular blocky; very hard, firm, sticky and plastic; common very fine and fine roots throughout; common very fine tubular pores; 14 percent calcium carbonate equivalent; common fine and medium irregular soft masses of carbonate; 2 percent subangular and subrounded mixed gravel; common fine prominent strong brown (7.5YR 5/6) and common fine and medium distinct gray (2.5Y 5/1) relict redoximorphic features; strongly effervescent; slightly alkaline; gradual wavy boundary.

Bk2—21 to 59 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; weak coarse prismatic structure parting to weak medium and coarse subangular blocky; very hard, firm, sticky and plastic; few very fine tubular pores; 11 percent calcium carbonate equivalent; many medium and coarse irregular soft masses of carbonate; 2 percent subangular mixed gravel; few fine prominent strong brown (7.5YR 4/6) and common medium and coarse distinct gray (2.5Y 5/1) relict redoximorphic features; strongly effervescent; slightly alkaline; diffuse irregular boundary.

C—59 to 80 inches; pale yellow (2.5Y 7/4) clay loam, light olive brown (2.5Y 5/4) moist; massive; very hard, firm, sticky and plastic; few very fine tubular pores; 10 percent calcium carbonate equivalent; common fine irregular soft masses of carbonate; 2 percent subangular mixed gravel; common fine and medium prominent strong brown (7.5YR 5/6) and many medium distinct gray (2.5Y 6/1) relict redoximorphic features; strongly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 18 inches
Depth to carbonates: 0 to 8 inches
Depth to contrasting parent material: More than 60 inches
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches

A horizon:
Hue—10YR
Value—3 or 4 (2 moist)
Chroma—1 or 2
Texture—clay loam or loam

Bw horizon:
Hue—10YR or 2.5Y
Value—4 to 6 (2 to 5 moist)
Chroma—1 to 3
Texture—clay loam or loam

Bk horizon:
Hue—10YR or 2.5Y
Value—4 to 6 (3 to 5 moist)
Chroma—2 to 4
Texture—clay loam

C horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—clay loam or loam

Splitrock Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderately slow
Landform: Till plains
Parent material: Loess over loamy glacial till
Slope: 0 to 6 percent

Typical Pedon

Splitrock silty clay loam, 2 to 6 percent slopes, 203 feet south and 2,230 feet east of the northwest corner of sec. 25, T. 104 N., R. 49 W.; USGS Dell Rapids, SD, topographic quadrangle; lat. 43 degrees 47 minutes 22 seconds N. and long. 96 degrees 39 minutes 38 seconds W.

Ap—0 to 9 inches; dark gray (10YR 4/1) silty clay loam, very dark gray (10YR 3/1) moist; moderate fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine roots throughout; common fine vesicular and tubular pores; moderately acid; clear smooth boundary.

Bw1—9 to 19 inches; brown (10YR 5/3) silty clay loam, brown (10YR 4/3) moist; weak medium prismatic structure parting to moderate medium subangular blocky; slightly hard, very friable, slightly sticky and slightly plastic; common very fine roots throughout; common very fine tubular pores; common wormcasts; slightly acid; clear smooth boundary.

Bw2—19 to 34 inches; pale brown (10YR 6/3) silty clay loam, grayish brown (10YR 5/2) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; slightly hard, very friable, slightly sticky and slightly plastic; common very fine roots throughout; common very fine tubular pores; neutral; clear wavy boundary.

2Bk—34 to 51 inches; pale yellow (2.5Y 7/3) clay loam, light olive brown (2.5Y 5/3) moist; weak medium prismatic structure parting to moderate medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots throughout; common very fine to medium tubular pores; 12 percent calcium carbonate equivalent; few discontinuous carbonate coats on rock fragments; common medium and coarse rounded soft masses of carbonate; 1 percent subangular mixed gravel; few fine prominent gray (10YR 5/1) redoximorphic depletions; strongly effervescent; slightly alkaline; gradual smooth boundary.

2C1—51 to 66 inches; pale yellow (2.5Y 7/3) clay loam, light olive brown (2.5Y 5/3) moist; massive; hard, firm, slightly sticky and slightly plastic; few very fine tubular pores; 13 percent calcium carbonate equivalent; very few prominent patchy black (10YR 2/1) manganese or iron-manganese stains and very few prominent patchy strong brown (7.5YR 4/6) iron stains throughout; common medium irregular soft masses of carbonate; 2 percent subangular mixed gravel; common medium prominent yellowish brown (10YR 5/6) redoximorphic concentrations and common fine prominent (10YR 5/1) redoximorphic depletions; strongly effervescent; slightly alkaline; gradual smooth boundary.

2C2—66 to 80 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; massive; hard, firm, slightly sticky and slightly plastic; few very fine tubular pores; 14 percent calcium carbonate equivalent; very few prominent patchy dark brown (7.5YR 3/4) iron stains in root channels and/or pores; few medium and coarse irregular soft masses of carbonate; 2 percent subangular mixed gravel; common fine distinct yellowish brown (10YR 5/4) redoximorphic concentrations and common fine prominent gray (10YR 5/1) redoximorphic depletions; violently effervescent; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 20 inches
Depth to carbonates: 18 to 40 inches
Depth to contrasting parent material: 20 to 40 inches over loamy glacial till
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches
Other features: Some pedons have a Bk horizon of silt loam or silty clay loam.

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1 or 2
Texture—silty clay loam or silt loam

Bw horizon:
Hue—10YR
Value—4 to 6 (3 to 5 moist)
Chroma—2 or 3
Texture—silty clay loam or silt loam; fine sand or fine sandy loam in the lower part in some pedons

2Bk horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—clay loam or loam

2C horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—clay loam or loam

Steinauer Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderately slow
Landform: Moraines
Parent material: Loamy glacial till
Slope: 25 to 60 percent

Typical Pedon

Steinauer clay loam, in an area of Steinauer-Shindler clay loams, 25 to 60 percent slopes, 50 feet north and 830 feet east of the southwest corner of sec. 4, T. 101 N., R. 48 W.; USGS Brandon, SD/IA, topographic quadrangle; lat. 43 degrees 34 minutes 22 seconds N. and long. 96 degrees 36 minutes 24 seconds W.

A—0 to 4 inches; grayish brown (10YR 5/2) clay loam, very dark gray (10YR 3/1) moist; weak fine and medium subangular blocky structure parting to weak fine granular; hard, friable, slightly sticky and slightly plastic; many fine and medium roots throughout; 7 percent calcium carbonate equivalent; 2 percent subrounded and subangular mixed gravel; strongly effervescent; slightly alkaline; clear wavy boundary.

AC—4 to 13 inches; grayish brown (10YR 5/2) and light brownish gray (10YR 6/2) clay loam, dark grayish brown (10YR 4/2) and light olive brown (2.5Y 5/3) moist; weak fine and medium subangular blocky structure parting to weak fine granular; hard, friable, slightly sticky and slightly plastic; common fine and medium roots throughout; few very fine and fine tubular pores; 8 percent calcium carbonate equivalent; few fine prominent yellowish brown (10YR 5/6) redoximorphic concentrations; 2 percent subrounded and subangular mixed gravel; strongly effervescent; slightly alkaline; clear wavy boundary.

C1—13 to 33 inches; light yellowish brown (2.5Y 6/3) clay loam, light olive brown (2.5Y 5/3) moist; massive; hard, firm, slightly sticky and slightly plastic; few fine roots throughout; few very fine tubular pores; 9 percent calcium carbonate equivalent; 2 percent subangular mixed gravel; few

fine prominent brownish yellow (10YR 6/8) and few fine distinct light gray (2.5Y 7/1) relict redoximorphic features; strongly effervescent; moderately alkaline; gradual wavy boundary.

C2—33 to 43 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; massive; hard, firm, slightly sticky and slightly plastic; few fine roots throughout; few very fine tubular pores; 7 percent calcium carbonate equivalent; few fine irregular soft masses of carbonate throughout; 2 percent subangular mixed gravel; common fine prominent brownish yellow (10YR 6/8) and common fine prominent strong brown (7.5YR 5/8) relict redoximorphic features; strongly effervescent; moderately alkaline; diffuse wavy boundary.

C3—43 to 80 inches; light yellowish brown (2.5Y 6/3) clay loam, grayish brown (2.5Y 5/2) moist; massive; hard, firm, slightly sticky and slightly plastic; few very fine tubular pores; 7 percent calcium carbonate equivalent; few fine rounded black (10YR 2/1) soft masses of iron-manganese throughout and few fine irregular soft masses of carbonate throughout; 2 percent subangular mixed gravel; common fine prominent brownish yellow (10YR 6/8) and few fine prominent strong brown (7.5YR 5/8) relict redoximorphic features; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonates: 0 to 10 inches
Depth to contrasting parent material: More than 60 inches
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches

A horizon:
Hue—10YR
Value—3 to 6 (2 to 5 moist)
Chroma—1 or 2
Texture—clay loam or loam

AC horizon:
Hue—10YR or 2.5Y
Value—5 or 6 (4 or 5 moist)
Chroma—2 to 4
Texture—clay loam or loam

C horizon:
Hue—10YR or 2.5Y
Value—6 or 7 (5 or 6 moist)
Chroma—2 to 4
Texture—clay loam or loam

Talmo Series

Depth to bedrock: Very deep
Drainage class: Excessively drained
Permeability: Very rapid
Landform: Outwash plains and moraines
Parent material: Glacial outwash
Slope: 2 to 40 percent

Typical Pedon

Talmo gravelly loam (fig. 37), in an area of Talmo-Delmont complex, 15 to 40 percent slopes, 2,350 feet north and 1,460 feet east of the southwest corner of sec. 28, T. 102 N., R. 48 W.; USGS Brandon, SD/IA, topographic quadrangle; lat. 43 degrees 36 minutes 29 seconds N. and long. 96 degrees 36 minutes 23 seconds W.

A—0 to 7 inches; very dark gray (10YR 3/1) gravelly loam, black (10YR 2/1) moist; weak medium granular structure; slightly hard, very friable; many very fine and fine roots throughout; 6 percent calcium carbonate equivalent; 20 percent subrounded mixed gravel; slightly effervescent; slightly alkaline; clear smooth boundary.

2C1—7 to 15 inches; grayish brown (10YR 5/2) very gravelly loamy sand, brown (10YR 4/3) moist; single grain; loose; common very fine roots throughout; 6 percent calcium carbonate equivalent; few patchy carbonate coats on the lower surfaces of peds or rocks; 35 percent subrounded mixed gravel; strongly effervescent; slightly alkaline; gradual smooth boundary.

2C2—15 to 55 inches; pale brown (10YR 6/3) very gravelly sand, brown (10YR 4/3) moist; single grain; loose; common very fine roots throughout; 6 percent calcium carbonate equivalent; very few patchy carbonate coats on sand and gravel; 40 percent subrounded mixed gravel; strongly effervescent; slightly alkaline; gradual smooth boundary.

2C3—55 to 80 inches; grayish brown (10YR 5/2) very gravelly sand, dark grayish brown (10YR 4/2) moist; single grain; loose; 7 percent calcium carbonate equivalent; very few prominent patchy yellowish brown (10YR 5/6) iron stains and very few patchy carbonate coats on sand and gravel; 55 percent subrounded mixed gravel; strongly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 14 inches
Depth to carbonates: 0 to 14 inches

Depth to contrasting parent material: 0 to 14 inches over gravelly material
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1 or 2
Texture—gravelly loam, loam, or sandy loam

2C horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—very gravelly sand, very gravelly loamy sand, extremely gravelly loamy sand, or very gravelly sandy loam; fine sand below a depth of 60 inches in some pedons

Tetonka Series

Depth to bedrock: Very deep
Drainage class: Poorly drained
Permeability: Slow
Landform: Till plains
Parent material: Local clayey alluvium
Slope: 0 to 1 percent

Typical Pedon

Tetonka silt loam (fig. 38), 0 to 1 percent slopes, 2,600 feet north and 1,600 feet west of the southeast corner of sec. 20, T. 104 N., R. 52 W.; USGS Buffalo Trading Post, SD, topographic quadrangle; lat. 43 degrees 47 minutes 52 seconds N. and long. 97 degrees 05 minutes 44 seconds W.

A—0 to 7 inches; dark gray (10YR 4/1) silt loam, black (10YR 2/1) moist; moderate very fine granular structure; soft, very friable, slightly sticky and slightly plastic; common very fine and fine roots throughout; few fine tubular pores; moderately acid; clear smooth boundary.

E—7 to 16 inches; gray (10YR 6/1) silt loam, dark gray (10YR 4/1) moist; moderate very thin platy structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine and fine roots throughout; common very fine and fine tubular pores; common fine faint dark brown (7.5YR 3/2) redoximorphic concentrations; moderately acid; clear smooth boundary.

E/B—16 to 20 inches; gray (10YR 6/1) silt loam, dark gray (10YR 4/1) moist (E); gray (10YR 5/1) silty clay, very dark gray (10YR 3/1) moist (B); weak very thin platy and strong very fine angular blocky structure; slightly hard, firm, slightly sticky and slightly plastic; common very fine and fine roots throughout; common very fine and fine tubular pores; common fine distinct dark brown (7.5YR 3/2) redoximorphic concentrations; moderately acid; clear smooth boundary.

Bt1—20 to 34 inches; gray (10YR 5/1) silty clay, very dark gray (10YR 3/1) moist; moderate medium prismatic structure parting to strong very fine angular blocky; slightly hard, firm, very sticky and very plastic; few very fine and fine roots throughout; common very fine and fine tubular pores; few continuous clay films on vertical faces of peds; few fine rounded iron-manganese concretions; common fine distinct dark brown (7.5YR 3/2) redoximorphic concentrations; neutral; clear smooth boundary.

Bt2—34 to 45 inches; gray (10YR 5/1) silty clay, very dark gray (10YR 3/1) moist; moderate medium prismatic structure parting to strong very fine angular blocky; very hard, very firm, very sticky and very plastic; common fine tubular pores; few discontinuous clay films on vertical faces of peds; few fine rounded iron-manganese concretions; common fine and medium distinct dark brown (7.5YR 3/2) redoximorphic concentrations; neutral; clear smooth boundary.

Bg—45 to 60 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; weak fine angular blocky structure; very hard, firm, very sticky and very plastic; few very fine tubular pores; common fine and medium prominent yellowish brown (10YR 5/6) redoximorphic concentrations and common fine and medium distinct dark gray (10YR 4/1) redoximorphic depletions; neutral; clear smooth boundary.

Cg—60 to 80 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; very hard, firm, sticky and plastic; few very fine and fine tubular pores; very few distinct patchy black (10YR 2/1) manganese or iron-manganese stains; common fine and medium prominent yellowish brown (10YR 5/6) redoximorphic concentrations and common fine and medium distinct dark gray (10YR 4/1) redoximorphic depletions; neutral.

Range in Characteristics

Thickness of the mollic epipedon: 24 to 50 inches
Depth to carbonates: More than 30 inches
Depth to contrasting parent material: More than 60 inches
Depth to gypsum and other visible salts (other than carbonates): More than 50 inches

A horizon:
Hue—10YR
Value—4 or 5 (2 or 3 moist)
Chroma—1 or 2
Texture—silt loam or silty clay loam

E horizon:
Hue—10YR
Value—5 to 7 (3 or 4 moist)
Chroma—1 or 2
Texture—silt loam, loam, or silty clay loam

Bt horizon:
Hue—10YR or 2.5Y
Value—4 to 6 (2 to 4 moist)
Chroma—1 or 2
Texture—clay, silty clay, or silty clay loam

Bg horizon:
Hue—2.5Y or 5Y
Value—5 to 7 (4 or 5 moist)
Chroma—1 or 2
Texture—silty clay, silty clay loam, clay loam, or clay

Cg horizon:
Hue—2.5Y or 5Y
Value—5 to 7 (4 to 6 moist)
Chroma—1 to 4
Texture—clay loam, silty clay loam, silty clay, or loam

Thurman Series

Depth to bedrock: Very deep
Drainage class: Somewhat excessively drained
Permeability: Rapid
Landform: Till plains and moraines
Parent material: Eolian material
Slope: 2 to 15 percent

Typical Pedon

Thurman fine sandy loam (fig. 39), in an area of Thurman-Flandreau complex, 6 to 9 percent slopes, 1,100 feet east and 1,230 feet south of the northwest corner of sec. 11, T. 102 N., R. 49 W.; USGS Renner, SD, topographic quadrangle; lat. 43 degrees 39 minutes 22 seconds N. and long. 96 degrees 34 minutes 12 seconds W.

Ap—0 to 6 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure parting to weak fine granular; slightly hard, very friable; common very fine roots throughout; common very fine vesicular and tubular pores; neutral; clear smooth boundary.

A—6 to 10 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine and medium subangular blocky structure parting to weak fine granular; slightly hard, very friable; common very fine roots throughout; common very fine vesicular and tubular pores; neutral; gradual smooth boundary.

AC—10 to 18 inches; dark yellowish brown (10YR 4/4) fine sandy loam, dark brown (10YR 3/3) moist; weak fine granular structure; soft, very friable; few very fine roots throughout; neutral; gradual smooth boundary.

C1—18 to 31 inches; pale brown (10YR 6/3) loamy fine sand, brown (10YR 4/3) moist; single grain; soft, very friable; few very fine roots throughout; neutral; gradual smooth boundary.

C2—31 to 70 inches; light yellowish brown (10YR 6/4) fine sand, brown (10YR 5/3) moist; single grain; loose; 10 percent calcium carbonate equivalent; strongly effervescent; slightly alkaline; gradual smooth boundary.

C3—70 to 80 inches; light yellowish brown (10YR 6/4) fine sand, brown (10YR 5/3) moist; single grain; loose; 7 percent calcium carbonate equivalent; few fine and medium distinct gray (10YR 5/1) relict redoximorphic features; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 10 to 20 inches
Depth to carbonates: More than 22 inches
Depth to contrasting parent material: More than 60 inches
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches

A horizon:
Hue—10YR
Value—3 to 5 (2 or 3 moist)
Chroma—1 or 2
Texture—fine sandy loam or loamy fine sand

C horizon:
Hue—10YR
Value—5 to 7 (4 or 5 moist)
Chroma—2 to 4
Texture—loamy fine sand, fine sand, sand, or loamy sand

Trent Series

Depth to bedrock: Very deep
Drainage class: Moderately well drained
Permeability: Moderate
Landform: Till plains and plains
Parent material: Silty sediments
Slope: 0 to 2 percent

Typical Pedon

Trent silty clay loam (fig. 40), in an area of Moody-Trent silty clay loams, 0 to 2 percent slopes, 890 feet south and 200 feet west of the northeast corner of sec. 35, T. 104 N., R. 48 W.; USGS Dell Rapids Southeast, SD, topographic quadrangle; lat. 43 degrees 46 minutes 25 seconds N. and long. 96 degrees 33 minutes 08 seconds W.

Ap—0 to 7 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots throughout; moderately acid; abrupt smooth boundary.

A—7 to 15 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; weak fine and medium subangular blocky structure parting to weak fine granular; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots throughout; few very fine and fine tubular pores; slightly acid; gradual wavy boundary.

Bw1—15 to 23 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark gray (10YR 3/1) moist; weak medium and coarse prismatic structure parting to weak medium and coarse subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; few very fine and fine roots throughout; few very fine and fine tubular pores; slightly acid; clear wavy boundary.

Bw2—23 to 28 inches; pale brown (10YR 6/3) silty clay loam, dark grayish brown (10YR 4/2) moist; weak medium and coarse prismatic structure parting to moderate fine and medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; few very fine and fine roots throughout; few very fine and fine tubular pores; neutral; gradual wavy boundary.

Bw3—28 to 39 inches; brown (10YR 5/3) silty clay loam, dark grayish brown (10YR 4/2) moist; weak medium and coarse prismatic structure parting to moderate medium and coarse subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; few very fine tubular pores; few fine prominent yellowish brown (10YR 5/6) redoximorphic concentrations; slightly acid; gradual wavy boundary.

Bw4—39 to 46 inches; brown (10YR 5/3) silt loam, dark grayish brown (10YR 4/2) moist; weak medium and coarse prismatic structure parting to weak medium and coarse subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; few very fine tubular pores; common fine prominent yellowish brown (10YR 5/6) redoximorphic concentrations and few fine prominent light olive gray (5Y 6/2) redoximorphic depletions; neutral; clear wavy boundary.

Bk—46 to 52 inches; light brownish gray (2.5Y 6/2) silt loam, dark grayish brown (2.5Y 4/2) moist; weak coarse subangular blocky structure parting to weak medium subangular blocky; slightly hard, friable; common very fine tubular pores; 7 percent calcium carbonate equivalent; common fine and medium rounded soft masses of carbonate; common fine and medium prominent yellowish brown (10YR 5/8) redoximorphic concentrations and common fine and medium distinct gray (5Y 6/1) redoximorphic depletions; strongly effervescent; moderately alkaline; gradual wavy boundary.

C—52 to 80 inches; light brownish gray (2.5Y 6/2) silt loam, grayish brown (2.5Y 5/2) moist; massive; slightly hard, friable; common very fine and fine tubular pores; 6 percent calcium carbonate equivalent; few fine rounded soft masses of carbonate and few fine irregular very dark grayish brown (10YR 3/2) soft masses of iron-manganese throughout; common fine and medium prominent strong brown (7.5YR 5/6) and common fine and medium prominent yellowish brown (10YR 5/8) redoximorphic concentrations; common fine and medium distinct gray (5Y 6/1) redoximorphic depletions; strongly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 20 to 40 inches
Depth to carbonates: 30 to 60 inches
Depth to contrasting parent material: More than 40 inches over loamy glacial till
Depth to gypsum and other visible salts (other than carbonates): More than 60 inches

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1 or 2
Texture—silty clay loam or silt loam

Bw horizon:
Hue—10YR

Value—3 to 6 (2 to 5 moist)
Chroma—1 to 3
Texture—silty clay loam or silt loam

Bk horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—silt loam or silty clay loam

C horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—silt loam, silty clay loam, loam, or clay loam

Wakonda Series

Depth to bedrock: Very deep
Drainage class: Moderately well drained
Permeability: Moderate
Landform: Till plains and plains
Parent material: Silty sediments
Slope: 0 to 2 percent

Typical Pedon

Wakonda silty clay loam, in an area of Wakonda-Chancellor silty clay loams, 0 to 2 percent slopes, 1,050 feet north and 100 feet east of the southwest corner of sec. 5, T. 104 N., R. 48 W.; USGS Dell Rapids, SD, topographic quadrangle; lat. 43 degrees 50 minutes 23 seconds N. and long. 96 degrees 38 minutes 03 seconds W.

Ap—0 to 8 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; weak medium subangular blocky structure parting to weak fine granular; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots throughout; 7 percent calcium carbonate equivalent; slightly effervescent; slightly alkaline; clear smooth boundary.

A—8 to 13 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots throughout; common very fine and fine tubular pores; 8 percent calcium carbonate equivalent; slightly effervescent; slightly alkaline; gradual wavy boundary.

Bk1—13 to 19 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; weak coarse prismatic structure parting to weak medium and coarse subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots throughout; few very fine tubular pores; 15 percent calcium carbonate equivalent; common fine and medium soft masses of carbonate; violently effervescent; moderately alkaline; clear wavy boundary.

Bk2—19 to 28 inches; light olive brown (2.5Y 5/3) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure parting to weak medium and coarse subangular blocky; very hard, friable, slightly sticky and slightly plastic; common very fine and fine roots throughout; common very fine tubular pores; 12 percent calcium carbonate equivalent; common fine and medium soft masses of carbonate; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk3—28 to 38 inches; light olive brown (2.5Y 5/3) silty clay loam, olive brown (2.5Y 4/3) moist; weak coarse prismatic structure parting to weak medium and coarse subangular blocky; very hard, friable, slightly sticky and slightly plastic; common very fine and fine roots throughout; common very fine tubular pores; 11 percent calcium carbonate equivalent; common fine and medium soft masses of carbonate; common fine prominent yellow (10YR 7/6) redoximorphic concentrations; strongly effervescent; moderately alkaline; gradual wavy boundary.

C1—38 to 58 inches; light olive brown (2.5Y 5/3) silty clay loam, olive brown (2.5Y 4/3) moist; weak coarse prismatic structure parting to weak medium and coarse subangular blocky; very hard, friable, slightly sticky and slightly plastic; common very fine and fine roots throughout; common very fine tubular pores; 8 percent calcium carbonate equivalent; common fine and medium soft masses of carbonate; common fine prominent yellow (10YR 7/6) redoximorphic concentrations and common fine distinct light gray (2.5Y 7/1) redoximorphic depletions; strongly effervescent; moderately alkaline; gradual wavy boundary.

C2—58 to 73 inches; light yellowish brown (2.5Y 6/3) silt loam, light olive brown (2.5Y 5/3) moist; massive; very hard, friable, slightly sticky and slightly plastic; common very fine tubular pores; 7 percent calcium carbonate equivalent; common fine and medium prominent yellow (10YR 7/6) redoximorphic concentrations and common fine and medium distinct light gray (2.5Y 7/1) redoximorphic depletions; strongly effervescent; moderately alkaline; clear wavy boundary.

2C3—73 to 80 inches; light yellowish brown (2.5Y 6/4) loam, light olive brown (2.5Y 5/4) moist; massive; very hard, friable, slightly sticky and slightly

plastic; common very fine tubular pores; 6 percent calcium carbonate equivalent; common fine distinct yellowish brown (10YR 5/8) and common fine prominent brownish yellow (10YR 6/6) redoximorphic concentrations; many fine distinct light gray (10YR 7/1) redoximorphic depletions; 1 percent subangular mixed gravel; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 16 inches
Depth to carbonates: 0 to 6 inches
Depth to contrasting parent material: More than 40 inches over loamy glacial till
Depth to gypsum and other visible salts (other than carbonates): 7 to 16 inches

A horizon:
Hue—10YR
Value—3 to 5 (2 or 3 moist)
Chroma—1 or 2
Texture—silty clay loam, loam, or silt loam

B horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (3 to 5 moist)
Chroma—2 to 4
Texture—silt loam or silty clay loam

C horizon:
Hue—2.5Y or 5Y
Value—5 to 7 (4 to 6 moist)
Chroma—1 to 4
Texture—silt loam, silty clay loam, sandy loam, loam, or clay loam

2C horizon:
Hue—2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—1 to 4
Texture—loam or clay loam

Wentworth Series

Depth to bedrock: Very deep
Drainage class: Well drained and moderately well drained
Permeability: Moderate
Landform: Till plains
Parent material: Silty glacial till over loamy glacial till
Slope: 0 to 6 percent

Typical Pedon

Wentworth silty clay loam, in an area of Egan-Wentworth-Trent silty clay loams, 1 to 6 percent slopes, 155 feet north and 2,140 feet east of the southwest corner of sec. 11, T. 104 N., R. 51 W.; USGS Colton, SD, topographic quadrangle; lat. 43 degrees 49 minutes 11 seconds N. and long. 96 degrees 55 minutes 19 seconds W.

Ap—0 to 10 inches; dark gray (10YR 4/1) silty clay loam, very dark gray (10YR 3/1) moist; weak fine subangular blocky structure parting to weak fine granular; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots throughout; slightly acid; abrupt wavy boundary.

Bw—10 to 26 inches; brown (10YR 5/3) silty clay loam, dark grayish brown (10YR 4/2) moist; weak medium prismatic structure parting to weak fine and medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots throughout; common very fine and fine tubular pores; neutral; abrupt wavy boundary.

Bk1—26 to 43 inches; light yellowish brown (2.5Y 6/3) silty clay loam, light olive brown (2.5Y 5/3) moist; weak coarse prismatic structure parting to weak coarse subangular blocky; hard, friable, slightly sticky and slightly plastic; common very fine and fine roots throughout; common very fine and fine tubular pores; 6 percent calcium carbonate equivalent; common medium irregular soft masses of carbonate; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk2—43 to 55 inches; light yellowish brown (2.5Y 6/3) silty clay loam, light olive brown (2.5Y 5/3) moist; weak coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine and fine roots throughout; common very fine and fine tubular pores; 7 percent calcium carbonate equivalent; common medium irregular soft masses of carbonate; few fine faint gray (2.5Y 5/1) redoximorphic depletions; strongly effervescent; moderately alkaline; clear irregular boundary.

C—55 to 80 inches; light brownish gray (2.5Y 6/2) silt loam and stratified fine sandy loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, friable; common very fine tubular pores; 6 percent calcium carbonate equivalent; common fine prominent reddish yellow (7.5YR 6/8) redoximorphic concentrations and common fine distinct light gray (2.5Y 7/1) redoximorphic depletions; strongly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 8 to 20 inches
Depth to carbonates: 20 to 36 inches
Depth to contrasting parent material: More than 40 inches over loamy glacial till

Depth to gypsum and other visible salts (other than carbonates): More than 60 inches

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1 or 2
Texture—silty clay loam or silt loam

Bw horizon:
Hue—10YR or 2.5Y
Value—5 or 6 (3 or 4 moist)
Chroma—2 to 4
Texture—silty clay loam or silt loam

Bk horizon:
Hue—10YR or 2.5Y
Value—4 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—silty clay loam or silt loam

C horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—silt loam or silty clay loam; stratified loam or fine sandy loam in some pedons

Whitewood Series

Depth to bedrock: Very deep
Drainage class: Somewhat poorly drained
Permeability: Moderately slow
Landform: Till plains or plains
Parent material: Local silty alluvium
Slope: 0 to 2 percent

Typical Pedon

Whitewood silty clay loam, 0 to 2 percent slopes, 2,495 feet south and 527 feet east of the northwest corner of sec. 19, T. 102 N., R. 47 W.; USGS Brandon, SD/IA, topographic quadrangle; lat. 43 degrees 37 minutes 25 seconds N. and long. 96 degrees 31 minutes 48 seconds W.

Ap—0 to 10 inches; dark gray (10YR 4/1) silty clay loam, very dark gray (10YR 3/1) moist; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots throughout; common fine prominent strong brown (7.5YR 5/8) redoximorphic concentrations; slightly acid; abrupt smooth boundary.

A—10 to 16 inches; dark gray (10YR 4/1) silty clay loam, very dark gray (10YR 3/1) moist; weak fine subangular blocky structure parting to weak fine granular; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots throughout; common very fine and fine tubular pores; slightly acid; clear smooth boundary.

Bw—16 to 36 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; few very fine and fine roots throughout; common very fine and fine tubular pores; few fine prominent brown (7.5YR 4/4) redoximorphic concentrations; slightly acid; gradual wavy boundary.

Bg—36 to 50 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; few very fine and fine roots throughout; common very fine and fine tubular pores; common fine prominent reddish yellow (7.5YR 6/6) redoximorphic concentrations and common fine faint light brownish gray (2.5Y 6/2) redoximorphic depletions; neutral; abrupt wavy boundary.

Bkg—50 to 62 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure parting to weak medium subangular blocky; hard, friable, slightly sticky and slightly plastic; common very fine and fine tubular pores; 7 percent calcium carbonate equivalent; common fine rounded soft masses of carbonate and few fine rounded soft masses of iron-manganese; common fine prominent reddish yellow (7.5YR 6/6) redoximorphic concentrations and few fine faint light brownish gray (2.5Y 6/2) redoximorphic depletions; strongly effervescent; slightly alkaline; diffuse wavy boundary.

Cg—62 to 80 inches; light olive gray (5Y 6/2) silty clay loam, olive gray (5Y 5/2) moist; massive; hard, friable, slightly sticky and slightly plastic; common very fine and fine tubular pores; 5 percent calcium carbonate equivalent; few fine rounded soft masses of carbonate and few fine rounded soft masses of iron-manganese; common fine and medium prominent dark yellowish brown (10YR 4/6) redoximorphic concentrations; strongly effervescent; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: More than 24 inches
Depth to carbonates: 30 to 52 inches
Depth to contrasting parent material: More than 60 inches

Depth to gypsum and other visible salts (other than carbonates): More than 60 inches

A horizon:
Hue—10YR or 2.5Y
Value—3 or 4 (2 or 3 moist)
Chroma—1
Texture—silty clay loam or silt loam

Bw horizon:
Hue—10YR or 2.5Y
Value—3 or 4 (2 or 3 moist)
Chroma—1 or 2
Texture—silty clay loam or silt loam

Bg horizon:
Hue—2.5Y or 5Y
Value—5 to 7 (4 to 6 moist)
Chroma—1 or 2
Texture—silty clay loam or silt loam

Bkg horizon:
Hue—2.5Y or 5Y
Value—5 to 7 (4 to 6 moist)
Chroma—1 or 2
Texture—silty clay loam or silt loam

Cg horizon:
Hue—2.5Y or 5Y
Value—5 to 7 (4 to 6 moist)
Chroma—1 or 2
Texture—silty clay loam, silt loam, clay loam, loam, or silty clay

Worthing Series

Depth to bedrock: Very deep
Drainage class: Very poorly drained
Permeability: Slow
Landform: Till plains
Parent material: Local clayey alluvium
Slope: 0 to 1 percent

Typical Pedon

Worthing silty clay loam (fig. 41), 0 to 1 percent slopes, 55 feet south and 1,200 feet east of the northwest corner of sec. 13, T. 102 N., R. 52 W.; USGS Humboldt, SD, topographic quadrangle; lat. 43 degrees 38 minutes 42 seconds N. and long. 97 degrees 01 minute 30 seconds W.

A1—0 to 9 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; weak medium subangular blocky structure parting to moderate fine granular; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots throughout; neutral; clear smooth boundary.

A2—9 to 16 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots throughout; common very fine and fine tubular pores; neutral; clear wavy boundary.

Btg1—16 to 25 inches; very dark gray (10YR 3/1) silty clay, black (2.5Y 2/1) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; hard, firm, sticky and plastic; common very fine and fine roots throughout; common very fine tubular pores; common discontinuous clay films on faces of peds; neutral; clear wavy boundary.

Btg2—25 to 46 inches; dark gray (2.5Y 4/1) silty clay, very dark gray (2.5Y 3/1) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; very hard, firm, sticky and plastic; common very fine and fine roots throughout; common very fine tubular pores; common discontinuous clay films on faces of peds; few fine prominent yellowish brown (10YR 5/8) redoximorphic concentrations; neutral; gradual wavy boundary.

Bg—46 to 58 inches; gray (2.5Y 5/1) silty clay loam, very dark gray (2.5Y 3/1) moist; weak coarse subangular blocky structure; very hard, firm, sticky and plastic; common very fine and fine roots throughout; common very fine tubular pores; few patchy clay films on faces of peds; common fine prominent yellowish brown (10YR 5/8) redoximorphic concentrations; neutral; gradual wavy boundary.

Cg—58 to 80 inches; light olive gray (5Y 6/2) silty clay loam, olive gray (5Y 5/2) moist; massive; very hard, firm, sticky and plastic; common fine irregular soft masses of iron-manganese; common fine yellowish brown (10YR 5/6) redoximorphic concentrations and common fine and medium faint gray (2.5Y 6/1) redoximorphic depletions; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 35 to 60 inches
Depth to carbonates: More than 35 inches
Depth to contrasting parent material: More than 40 inches over loamy glacial till
Depth to gypsum and other visible salts (other than carbonates): More than 35 inches

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1
Texture—silty clay loam or silt loam

Btg horizon:
Hue—10YR to 5Y or N
Value—2 to 5 (2 or 3 moist)
Chroma—0 or 1
Texture—silty clay or clay

Bg horizon:
Hue—2.5Y or 5Y
Value—4 to 7 (3 to 5 moist)
Chroma—1 or 2
Texture—silty clay loam, clay, or clay loam

Cg horizon:
Hue—2.5Y or 5Y
Value—4 to 7 (3 to 6 moist)
Chroma—1 or 2
Texture—silty clay loam, silty clay, clay, or clay loam

Formation of the Soils

Soil forms when chemical and physical processes act on geologically deposited or accumulated material. The characteristics of the soil at any given point are determined by the physical and mineralogical composition of the parent material, the climate under which the soil material has accumulated and existed since accumulation, the plant and animal life on and in the soil, the relief, and the length of time that the forces of soil formation have acted on the soil material.

Climate and plant and animal life are active factors of soil formation. They act on the parent material and slowly change it to a natural body that has genetically related horizons. The effects of climate and plant and animal life are modified by relief. The parent material affects the kind of soil profile that forms and in extreme cases determines it almost entirely. Finally, time is needed for changing the parent material into a soil having genetically related horizons. Usually, a long time is required for the development of distinct horizons.

The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effect of any one factor unless conditions are specified for the other four. The following paragraphs relate the factors of soil formation to the soils in Minnehaha County.

Climate

Climate directly influences the rate of chemical and physical weathering. Minnehaha County has a continental climate marked by cold winters and hot summers. This climate favors the growth of grasses and the resulting accumulation of organic matter in the upper part of the soil. Freezing of the soil during the winter slows the soil-forming processes. Alternate periods of freezing and thawing, however, help to disintegrate parent materials, and frost heaving helps to mix soil material. The precipitation in the survey area is sufficient to leach carbonates in most soils to an average depth of 16 to more than 40 inches. The climate is generally uniform throughout the county and thus as a separate factor does not differentiate the soils within the county.

Plant and Animal Life

Plants, animals, insects, earthworms, bacteria, and fungi have an important effect on soil formation. They cause gains in organic matter, gains or losses in plant nutrients, and changes in soil structure and porosity. In Minnehaha County the prairie grasses have had more influence than other living organisms on soil formation. As a result of these grasses, the surface layer of many soils has a moderate or high content of organic matter. Moody and Trent soils are examples.

Earthworms, insects, and burrowing animals help to keep the soil open and porous. Bacteria and fungi decompose plant residue, thus releasing nutrients that plants utilize.

Parent Material

Most of the soils in Minnehaha County formed in glacial material derived from preglacial formations of granite, limestone, quartzite, sandstone, and shale. The glacier ground up and mixed these materials as it transported them. When the glacier melted, the glacial material was redeposited. Some deposits consist of unsorted materials, or glacial till. Other material was sorted either by water or by wind and water after it was deposited.

Loess is wind-deposited material that is mainly silt and very fine sand. Moody, Nora, and Crofton soils formed in thick deposits of loess.

Silty glacial till is material that was deposited on glacial ice and then reworked by water and wind as the glacier melted. Wentworth soils formed in this material. Egan soils formed in a thin mantle of silty glacial till and in the underlying loamy glacial till.

Loamy glacial till is a mixture of clay, silt, sand, and gravel that contains few to many cobblestones and boulders. The content of pebbles and cobblestones is higher than that in silty glacial till. The proportion of each kind of material is determined by the kind of material picked up by the glacier. Houdek and Ethan soils are examples of soils that formed in loamy glacial till.

Glacial outwash is sandy, gravelly, and loamy

material deposited by glacial meltwater. Delmont, Dempster, Enet, and Talmo soils formed in silty or loamy material underlain by sand and gravel within a depth of 40 inches.

Chancellor, Crossplain, and Worthing soils formed partly or entirely in local alluvium that washed from the more sloping adjacent soils in the uplands. Bon and Lamo soils formed in alluvium deposited by streams.

Benclare and Corson soils are examples of soils that formed in clayey lacustrine sediments deposited when meltwater ponded.

Relief

Relief influences soil formation through its effect on drainage, runoff, erosion, plant cover, and soil temperature. On the more sloping soils, such as Crofton and Betts soils, much of the rainfall is lost through runoff and does not penetrate the surface. In addition, some surface soil is lost through erosion. As a result, these soils have a thin surface layer and are calcareous at or near the surface.

Runoff is slower in areas of Egan, Moody, and other less sloping soils, and more rainfall penetrates the surface. These soils are calcareous at a greater depth than the Crofton and Betts soils. Also, the horizons in which organic matter accumulates are thicker.

Davis and Trent soils are in areas on footslopes that receive extra moisture in the form of runoff from adjacent soils. The layers in which organic matter accumulates are thicker than those in the Egan and Moody soils. Also, calcium carbonate is leached to a greater depth. In low areas where drainage is impeded, the fluctuating water table favors the concentration of calcium carbonate and other soluble salts in Davison, Wakonda, and other soils. Tetonka and Worthing soils are in basins where water ponds. These soils have the colors characteristic of poorly drained soils.

Time

The length of time that soil material has been exposed to the other factors of soil formation is reflected in the kinds of soil that have formed. The degree of profile development reflects the age of a soil. The oldest soils are on the part of the landscape that has been stable for the longest time. In Minnehaha County, these are Egan, Houdek, and Moody soils. The youngest soils either are those in which natural erosion removes nearly as much soil material as is formed through the weathering of parent material or are alluvial soils, which receive new material each time the area is flooded. Betts and Steinauer soils are examples of young soils that are subject to natural erosion. Chaska and Lamo soils are examples of young alluvial soils.

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Glossary

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alkali (sodic) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Alpha,alpha-dipyridyl. A dye that when dissolved in 1N ammonium acetate is used to detect the presence of reduced iron (Fe II) in the soil. A positive reaction indicates a type of redoximorphic feature.

Aquic conditions. Current soil wetness characterized by saturation, reduction, and redoximorphic features.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Argillic horizon. A subsoil horizon characterized by an accumulation of illuvial clay.

Association, soil. A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Atterberg limits. The collective designation of seven so-called limits of consistency of fine grained soils, suggested by Albert Atterberg. The current usage typically retains only liquid limit, plastic limit, and plasticity index.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Backslope. The position that forms the steepest and generally linear, middle portion of a hillslope. In profile, backslopes are commonly bounded by a convex shoulder above and a concave footslope below.

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Basin. A depressed area with no surface outlet. Examples include closed depressions on a glacial till plain or lake basins.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay,

less than 45 percent sand, and less than 40 percent silt.

Clay depletions. Low-chroma zones having a low content of iron, manganese, and clay because of the chemical reduction of iron and manganese and the removal of iron, manganese, and clay. A type of redoximorphic depletion.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet. Commonly associated with high sodium conditions.

Climax plant community. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Closed depression. A low-lying area that is surrounded by higher ground and has no natural outlet for surface drainage.

Coarse textured soil. Sand or loamy sand.

Cobble (or cobblestone). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Complex, soil. A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Concretions. Cemented bodies with crude internal symmetry organized around a point, a line, or a plane. They typically take the form of concentric layers visible to the naked eye. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up concretions. If formed in place, concretions of iron oxide or manganese oxide are generally considered a type of redoximorphic concentration.

Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil. Refers to the degree of cohesion and adhesion of soil material and its resistance to deformation when ruptured. Consistence includes resistance of soil material to rupture and to penetration; plasticity, toughness, and stickiness of puddled soil material; and the manner in which the soil material behaves when subject to compression. Terms describing consistence are defined in the “Soil Survey Manual.”

Corrosion. Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

Crop residue management. Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

Cropping system. Growing crops according to a planned system of rotation and management practices.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Dendritic. A term describing a treelike pattern of stream drainage.

Denitrification. The reduction of nitrogen oxides (commonly nitrate and nitrite) to molecular nitrogen or nitrogen oxides with a lower oxidation state of nitrogen by bacterial activity (denitrification) or by chemical reactions involving nitrogen (chemodenitrification). Nitrogen oxides are used by bacteria as terminal electron acceptors in place of oxygen in anaerobic or microaerophilic respiratory metabolism.

Depth, soil. Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized—*excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained,* and *very poorly drained*. These classes are defined in the “Soil Survey Manual.”

Drainage, surface. Runoff, or surface flow of water, from an area.

Endosaturation. A type of saturation of the soil in

which all horizons between the upper boundary of saturation and a depth of 2 meters are saturated.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Episaturation. A type of saturation indicating a perched water table in a soil in which saturated layers are underlain by one or more unsaturated layers within 2 meters of the surface.

Erodibility. The degree or intensity of a soil's state or condition of, or susceptibility to, erosion.

Escarpment. A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. Synonym: scarp.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Excess salt (in tables). Excess water-soluble salts in the soil that restrict the growth of most plants.

Excess sodium (in tables). Excess exchangeable sodium in the soil. The resulting poor physical properties restrict the growth of plants.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grain is grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Fluvial. Of or pertaining to rivers; produced by river action, as a fluvial plain.

Footslope. The position that forms the inner, gently inclined surface at the base of a hillslope. In profile, footslopes are commonly concave. A footslope is a transition zone between upslope sites of erosion and transport (shoulders and backslopes) and downslope sites of deposition (toeslopes).

Forb. Any herbaceous plant not a grass or a sedge.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Glacial outwash. Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

Glacial till. Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciofluvial deposits. Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial meltwater. Many deposits are interbedded or laminated.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that has 15 to 35 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water. Water filling all the unblocked pores of the material below the water table.

Hard bedrock. Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

Head slope. A geomorphic component of hills consisting of a laterally concave area of a hillside, especially at the head of a drainageway. The overland waterflow is converging.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

High-residue crops. Such crops as small grain and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established.

These crops return large amounts of organic matter to the soil.

Hill. A natural elevation of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined outline; hillsides generally have slopes of more than 15 percent. The distinction between a hill and a mountain is arbitrary and is dependent on local usage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the “Soil Survey Manual.” The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff potential. The soil properties that influence this potential are those that affect the minimum rate of water infiltration on a bare soil during periods after prolonged wetting when the soil is not frozen. These properties are depth to a seasonal high water table, the infiltration rate and permeability after prolonged wetting, and depth to a very slowly permeable layer. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff.

Increasers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Interfluve. An elevated area between two drainageways that sheds water to those drainageways.

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, plants invade following disturbance of the surface.

Iron depletions. Low-chroma zones having a low

content of iron and manganese oxide because of chemical reduction and removal, but having a clay content similar to that of the adjacent matrix. A type of redoximorphic depletion.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are:

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Lacustrine deposit. Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Landform. Any physical, recognizable form or feature of the earth's surface, having a characteristic shape and produced by natural causes.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. The soil is not strong enough to support loads.

Masses. Concentrations of substances in the soil matrix that do not have a clearly defined boundary with the surrounding soil material and cannot be removed as a discrete unit. Common compounds making up masses are calcium carbonate, gypsum or other soluble salts, iron oxide, and manganese oxide. Masses consisting of iron oxide or manganese oxide generally are considered a type of redoximorphic concentration.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Mollic epipedon. A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

Moraine. An accumulation of earth, stones, and other debris deposited by a glacier. Some types are terminal, lateral, medial, and ground.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Used to describe color patterns not related to soil wetness. Descriptive terms are as follows: abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium,* from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse,* more than 15 millimeters (about 0.6 inch).

Muck. Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Native grass. A species of grass native to the region in which it is growing.

Neutral soil. A soil having a pH value of 6.6 to 7.3. (See Reaction, soil.)

Nose slope. A geomorphic component of hills consisting of the projecting end (laterally convex area) of a hillside. The overland waterflow is predominantly divergent.

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, molybdenum, chlorine, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:

Very low	less than 0.5 percent
Low	0.5 to 1.0 percent
Moderately low	1.0 to 2.0 percent
Moderate	2.0 to 4.0 percent
High	4.0 to 8.0 percent
Very high	more than 8.0 percent

Outwash plain. A landform of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it generally is low in relief.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called “a soil.” A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affects the specified use.

Permeability. The quality of the soil that enables water or air to move downward through the profile. The rate at which a saturated soil transmits water is accepted as a measure of this quality. In soil physics, the rate is referred to as “saturated hydraulic conductivity,” which is defined in the “Soil Survey Manual.” In line with conventional usage in the engineering profession and with traditional usage in published soil surveys, this rate of flow continues to be expressed as “permeability.” Terms describing permeability, measured in inches per hour, are as follows:

Extremely slow	0.0 to 0.01 inch
Very slow	0.01 to 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid or very rapid permeability, the soil may not adequately filter effluent from a waste disposal system.

Potential native vegetation. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Proper grazing use. Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This practice increases the vigor and reproduction capacity of the key plants and promotes the accumulation of litter and mulch necessary to conserve soil and water.

Range condition. The present composition of the plant community on a range site in relation to the

potential natural plant community for that site. Range condition is expressed as excellent, good, fair, or poor on the basis of how much the present plant community has departed from the potential.

Range site. An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Ultra acid	less than 3.5
Extremely acid	3.5 to 4.4
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Redoximorphic concentrations. Nodules, concretions, soft masses, pore linings, and other features resulting from the accumulation of iron or manganese oxide. An indication of chemical reduction and oxidation resulting from saturation.

Redoximorphic depletions. Low-chroma zones from which iron and manganese oxide or a combination of iron and manganese oxide and clay has been removed. These zones are indications of the chemical reduction of iron resulting from saturation.

Redoximorphic features. Redoximorphic concentrations, redoximorphic depletions, reduced matrices, a positive reaction to alpha,alpha-dipyridyl, and other features indicating the chemical reduction and oxidation of iron and manganese compounds resulting from saturation.

Reduced matrix. A soil matrix that has low chroma in situ because of chemically reduced iron (Fe II). The chemical reduction results from nearly continuous wetness. The matrix undergoes a change in hue or chroma within 30 minutes after exposure to air as the iron is oxidized (Fe III). A type of redoximorphic feature.

Relict redoximorphic features. Redoximorphic features that formed under a previous condition of soil wetness. This morphology is not indicative of present-day conditions.

Relief. The elevations or inequalities of a land surface, considered collectively.

Rill. A steep-sided channel resulting from accelerated erosion. A rill generally is a few inches deep and not wide enough to be an obstacle to farm machinery.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, gravel, cobbles, stones, and boulders.

Root zone. The part of the soil that can be penetrated by plant roots. Soil features that limit the root zone include gravel, coarse sand, bedrock, and a claypan.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Saturation. Wetness characterized by zero or positive pressure of the soil water. Under conditions of

saturation, the water will flow from the soil matrix into an unlined auger hole.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shoulder. The position that forms the uppermost inclined surface near the top of a hillslope. It is a transition from backslope to summit. The surface is dominantly convex in profile and erosional in origin.

Shrink-swell (in tables). The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Side slope. A geomorphic component of hills consisting of a laterally planar area of a hillside. The overland waterflow is predominantly parallel.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. In this survey, classes for simple slopes are as follows:

Level	0 to 1 percent
Nearly level	0 to 2 percent
Very gently sloping	1 to 4 percent
Gently sloping	2 to 6 percent
Moderately sloping	6 to 9 percent
Strongly sloping	9 to 15 percent
Moderately steep	15 to 25 percent
Steep	25 to 40 percent
Very steep	40 percent and higher

Classes for complex slopes are as follows:

Level	0 to 1 percent
Nearly level	0 to 2 percent
Gently undulating	1 to 4 percent
Undulating	2 to 6 percent
Gently rolling	6 to 9 percent
Rolling	9 to 15 percent
Hilly	15 to 25 percent
Steep	25 to 40 percent
Very steep	40 percent and higher

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soft bedrock. Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief and by the passage of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C

horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the material below the solum. The living roots and plant and animal activities are largely confined to the solum.

Stone line. A concentration of rock fragments in a soil. Generally, it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to wind erosion and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Summer fallow. The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

Summit. The topographically highest position of a hillslope. It has a nearly level (planar or only slightly convex) surface.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the “plow layer,” or the “Ap horizon.”

Surface soil. The A, E, AB, and EB horizons, considered collectively. It includes all subdivisions of these horizons.

Terminal moraine. A belt of thick glacial drift that generally marks the termination of important glacial advances.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field generally is built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying “coarse,” “fine,” or “very fine.”

Thin layer (in tables). Otherwise suitable soil material that is too thin for the specified use.

Till plain. An extensive area of nearly level to undulating soils underlain by glacial till.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toeslope. The position that forms the gently inclined surface at the base of a hillslope. Toeslopes in profile are commonly gentle and linear and are constructional surfaces forming the lower part of a hillslope continuum that grades to valley or closed-depression floors.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Transitional layer. A layer of soil that grades to the next layer or includes parts of adjacent layers, commonly between the surface layer and the subsoil or underlying layer.

Underlying layer. The C horizon or R layer; that part of the soil below the subsoil, commonly the parent material.

Upland. Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Varve. A sedimentary layer or a lamina or sequence of

laminae deposited in a body of still water within a year. Specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by meltwater streams, in a glacial lake or other body of still water in front of a glacier.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Tables

Table 1.--Temperature and Precipitation

(Recorded in the period 1971-2000 at Sioux Falls, South Dakota)

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days*	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	^{o}F	^{o}F	^{o}F	^{o}F	^{o}F	Units	In	In	In		In
January----	24.6	4.7	14.7	53	-25	0	0.51	0.20	0.75	1	7.4
February---	31.1	12.0	21.6	62	-24	0	.51	.19	.77	1	5.9
March------	43.3	23.4	33.3	78	-8	9	1.81	.77	2.75	4	8.1
April------	58.4	34.7	46.6	87	13	76	2.65	1.30	3.97	5	3.4
May--------	70.7	46.8	58.8	90	27	291	3.39	1.68	4.90	6	.0
June-------	80.2	56.6	68.4	99	38	553	3.49	1.83	4.92	6	.0
July-------	85.2	62.1	73.7	103	45	733	2.93	1.45	4.24	5	.0
August-----	82.7	59.9	71.3	100	43	661	3.01	1.43	4.34	5	.0
September--	73.7	49.0	61.3	95	28	354	2.58	1.08	3.80	4	.0
October----	60.7	36.3	48.5	86	15	93	1.93	.45	3.37	3	1.0
November---	41.5	22.3	31.9	70	-5	5	1.36	.31	2.55	2	7.6
December---	28.3	9.5	18.9	55	-21	0	.52	.17	.80	1	7.0
Yearly:											
Average---	56.7	34.8	45.7	---	---	---	---	---	---	---	---
Extreme---	---	---	---	104	-28	---	---	---	---	---	---
Total-----	---	---	---	---	---	2,776	24.68	19.08	30.33	43	40.6

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50 degrees F).

Table 2.--Freeze Dates in Spring and Fall

(Recorded in the period 1971-2000 at Sioux Falls, South Dakota)

Probability	Temperature: 24 ^{o}F or lower	Temperature: 28 ^{o}F or lower	Temperature: 32 ^{o}F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	Apr. 24	May 8	May 18
2 years in 10 later than--	Apr. 19	May 4	May 13
5 years in 10 later than--	Apr. 10	Apr. 25	May 2
First freezing temperature in fall:			
1 year in 10 earlier than--	Oct. 2	Sept. 22	Sept. 15
2 years in 10 earlier than--	Oct. 7	Sept. 27	Sept. 19
5 years in 10 earlier than--	Oct. 17	Oct. 6	Sept. 28

Table 3.--Growing Season

(Recorded in the period 1971-2000 at Sioux Falls, South Dakota)

Probability	Daily minimum temperature during growing season: Higher than 24 ^{o}F	Higher than 28 ^{o}F	Higher than 32 ^{o}F
	Days	Days	Days
9 years in 10	169	146	126
8 years in 10	176	152	133
5 years in 10	189	163	147
2 years in 10	202	175	161
1 year in 10	209	181	169

Table 4.--Acreage and Proportionate Extent of the Soils

Map symbol	Soil name	Acres	Percent
AcA	Alcester silty clay loam, 0 to 2 percent slopes	2,849	0.5
AcB	Alcester silty clay loam, 2 to 6 percent slopes	2,677	0.5
Ar	Arlo loam, 0 to 1 percent slopes	978	0.2
Ba	Baltic silty clay loam, 0 to 1 percent slopes	5,993	1.2
Bb	Baltic silty clay loam, ponded	4,815	0.9
BcA	Benclare-Corson complex, 0 to 2 percent slopes	1,835	0.4
BeE	Betts-Ethan loams, 15 to 40 percent slopes	1,228	0.2
BfA	Blendon fine sandy loam, 0 to 2 percent slopes	1,060	0.2
BhB	Blendon-Henkin fine sandy loams, 2 to 6 percent slopes	1,118	0.2
Bo	Bon loam, 0 to 2 percent slopes	4,093	0.8
Cb	Chancellor silty clay loam, 0 to 1 percent slopes	2,072	0.4
Cc	Chancellor-Tetonka complex, 0 to 1 percent slopes	7,280	1.4
Cd	Chaska loam, 0 to 2 percent slopes	2,009	0.4
Ch	Chaska loam, channeled	9,516	1.8
Cm	Clamo silty clay, 0 to 1 percent slopes	12,890	2.5
CoB	Corson silty clay, 2 to 6 percent slopes	934	0.2
CoC	Corson silty clay, 6 to 9 percent slopes	544	0.1
CpC	Corson-Henkin complex, 6 to 9 percent slopes	535	0.1
CrD	Crofton-Nora complex, 9 to 15 percent slopes	10,076	1.9
CrE	Crofton-Nora complex, 15 to 25 percent slopes	368	*
CsD	Crofton-Shindler complex, 9 to 15 percent slopes	3,462	0.7
DcA	Davis loam, 0 to 2 percent slopes	3,545	0.7
DcB	Davis loam, 2 to 6 percent slopes	1,154	0.2
DcC	Davis loam, 6 to 9 percent slopes	31	*
Dd	Davison-Crossplain clay loams, 0 to 2 percent slopes	3,233	0.6
DeA	Delmont-Enet loams, 0 to 2 percent slopes	794	0.2
DeB	Delmont-Enet loams, 2 to 6 percent slopes	1,074	0.2
DgC	Delmont-Talmo complex, 6 to 9 percent slopes	1,093	0.2
DgD	Delmont-Talmo complex, 9 to 15 percent slopes	725	0.1
DmA	Dempster silt loam, 0 to 2 percent slopes	6,619	1.3
DmB	Dempster silt loam, 2 to 6 percent slopes	1,388	0.3
DtB	Dempster-Talmo complex, 2 to 6 percent slopes	738	0.1
Dw	Dimo clay loam, 0 to 2 percent slopes	820	0.2
DxB	Dobalt loam, 2 to 6 percent slopes	3,159	0.6
DyA	Dobalt-Bonilla loams, 0 to 2 percent slopes	461	*
EaB	Egan-Ethan complex, 2 to 6 percent slopes	1,178	0.2
EeB	Egan-Ethan-Trent complex, 1 to 6 percent slopes	49,400	9.5
EfA	Egan-Trent silty clay loams, 0 to 2 percent slopes	3,108	0.6
EgB	Egan-Wentworth-Trent silty clay loams, 1 to 6 percent slopes	20,550	3.9
EnA	Enet loam, 0 to 2 percent slopes, rarely flooded	336	*
EoA	Enet-Dimo complex, 0 to 2 percent slopes	358	*
EpD	Ethan-Betts loams, 9 to 15 percent slopes	1,387	0.3
EsE	Ethan-Clarno loams, 6 to 25 percent slopes, very stony	935	0.2
EtD	Ethan-Clarno loams, 9 to 15 percent slopes	4,433	0.9
EuC	Ethan-Egan complex, 6 to 9 percent slopes	27,880	5.4
ExC	Ethan, very stony-Egan complex, 2 to 9 percent slopes	462	*
FaA	Flandreau loam, 0 to 2 percent slopes	1,597	0.3
FaB	Flandreau loam, 2 to 6 percent slopes	5,047	1.0
FtB	Flandreau-Thurman complex, 2 to 6 percent slopes	4,639	0.9
GrA	Graceville silty clay loam, 0 to 2 percent slopes	5,996	1.2
GsB	Grovena loam, 2 to 6 percent slopes	6,574	1.3
GvA	Grovena-Bonilla loams, 0 to 2 percent slopes	2,650	0.5
HoB	Houdek clay loam, 2 to 6 percent slopes	1,059	0.2
HsC	Houdek-Shindler clay loams, 6 to 9 percent slopes	2,234	0.4
HsD	Houdek-Shindler clay loams, 9 to 15 percent slopes	827	0.2
HtD	Houdek-Talmo complex, 9 to 15 percent slopes	944	0.2
HuA	Huntimer silty clay loam, 0 to 2 percent slopes	3,293	0.6
HuB	Huntimer silty clay loam, 2 to 6 percent slopes	1,817	0.3
IhA	Ihlen silty clay loam, 0 to 2 percent slopes	368	*
IrB	Ihlen-Rock outcrop complex, 0 to 4 percent slopes	1,081	0.2
IrE	Ihlen-Rock outcrop complex, 4 to 35 percent slopes	1,129	0.2
Ja	Janude fine sandy loam, 0 to 2 percent slopes	713	0.1
La	Lamo silty clay loam, 0 to 1 percent slopes	6,221	1.2

See footnote at end of table.

Table 4.--Acreage and Proportionate Extent of the Soils--Continued

Map symbol	Soil name	Acres	Percent
Lb	Lamo silty clay loam, channeled	9,696	1.9
M-W	Miscellaneous water	248	*
MdB	Moody silty clay loam, 2 to 6 percent slopes	15,561	3.0
MgA	Moody-Gayville complex, 0 to 3 percent slopes	101	*
MnB	Moody-Nora silty clay loams, 2 to 6 percent slopes	51,001	9.8
MnC	Moody-Nora silty clay loams, 6 to 9 percent slopes	7,110	1.4
MtA	Moody-Trent silty clay loams, 0 to 2 percent slopes	12,590	2.4
NcC	Nora-Crofton complex, 6 to 9 percent slopes	70,270	13.5
Ob	Obert silty clay loam, 0 to 1 percent slopes	10,851	2.1
Og	Orthents, gravelly	1,007	0.2
Or	Orthents, loamy	890	0.2
Ow	Orthents-Aquents complex, gravelly	1,003	0.2
Pt	Pits, quarry	387	*
Sa	Salmo silty clay loam, 0 to 1 percent slopes	172	*
SdE	Shindler-Houdek clay loams, 15 to 40 percent slopes	2,730	0.5
SnE	Shindler-Talmo complex, 15 to 40 percent slopes	1,253	0.2
SpA	Splitrock silty clay loam, 0 to 2 percent slopes	1,183	0.2
SpB	Splitrock silty clay loam, 2 to 6 percent slopes	5,572	1.1
SsF	Steinauer-Shindler clay loams, 25 to 60 percent slopes	2,369	0.5
TdE	Talmo-Delmont complex, 15 to 40 percent slopes	150	*
Te	Tetonka silt loam, 0 to 1 percent slopes	420	*
TfC	Thurman-Flandreau complex, 6 to 9 percent slopes	8,172	1.6
TgD	Thurman-Grovena complex, 9 to 15 percent slopes	561	0.1
Tr	Trent silty clay loam, 0 to 2 percent slopes	6,868	1.3
W	Water	3,964	0.8
Wa	Wakonda-Chancellor silty clay loams, 0 to 2 percent slopes	8,505	1.6
WcA	Wentworth-Chancellor-Wakonda silty clay loams, 0 to 2 percent slopes	4,868	0.9
WhA	Wentworth-Trent silty clay loams, 0 to 2 percent slopes	3,160	0.6
WhB	Wentworth-Trent silty clay loams, 1 to 6 percent slopes	3,555	0.7
Wk	Whitewood silty clay loam, 0 to 2 percent slopes	17,120	3.3
Wo	Worthing silty clay loam, 0 to 1 percent slopes	3,068	0.6
Wr	Worthing-Davison complex, 0 to 2 percent slopes	8,839	1.7
	Total	520,627	100.0

* Less than 0.05 percent.

Table 5.--Soil Productivity Ratings

(The abbreviation "NS" means not suited)

Soil name and map symbol	Crop rating	Range rating	Productivity rating
AcA: Alcester	94.9	61.9	94.9
AcB: Alcester	90.4	51.8	90.4
Ar: Arlo	37.0	65.9	65.9
Ba: Baltic	14.7	37.1	37.1
Bb: Baltic	2.8	19.3	19.3
BcA: Benclare-Corson	82.6	46.7	82.6
BeE: Betts-Ethan	8.2	29.9	29.9
BfA: Blendon	68.6	45.4	68.6
BhB: Blendon-Henkin	63.2	44.1	63.2
Bo: Bon	82.5	60.4	82.5
Cb: Chancellor	67.2	58.2	67.2
Cc: Chancellor-Tetonka	56.1	55.8	56.1
Cd: Chaska	61.4	73.2	73.2
Ch: Chaska	27.8	53.2	53.2
Cm: Clamo	45.8	48.8	48.8
CoB: Corson	72.4	42.4	72.4
CoC: Corson	61.1	40.4	61.1
CpC: Corson-Henkin	51.7	36.9	51.7
CrD: Crofton-Nora	49.8	38.2	49.8
CrE: Crofton-Nora	24.1	36.5	36.5
CsD: Crofton-Shindler	37.5	33.4	37.5

Table 5.--Soil Productivity Ratings--Continued

Soil name and map symbol	Crop rating	Range rating	Productivity rating
DcA--- Davis	90.9	59.2	90.9
DcB--- Davis	86.8	55.7	86.8
DcC--- Davis	76.9	53.7	76.9
Dd--- Davison-Crossplain	65.1	54.7	65.1
DeA--- Delmont-Enet	45.3	33.0	45.3
DeB--- Delmont-Enet	42.8	32.3	42.8
DgC--- Delmont-Talmo	22.7	24.7	24.7
DgD--- Delmont-Talmo	14.0	23.4	23.4
DmA--- Dempster	67.8	39.0	67.8
DmB--- Dempster	61.7	38.5	61.7
DtB--- Dempster-Talmo	50.1	34.0	50.1
Dw--- Dimo	72.5	56.0	72.5
DxB--- Dobalt	81.5	44.9	81.5
DyA--- Dobalt-Bonilla	88.5	49.5	88.5
EaB--- Egan-Ethan	71.5	41.0	71.5
EeB--- Egan-Ethan-Trent	77.1	46.7	77.1
EfA--- Egan-Trent	86.8	50.8	86.8
EgB--- Egan-Wentworth-Trent	82.5	48.6	82.5
EnA--- Enet	59.0	41.5	59.0
EoA--- Enet-Dimo	65.0	47.9	65.0
EpD--- Ethan-Betts	34.6	32.0	34.6
EsE--- Ethan-Clarno	0.0	29.9	29.9

Table 5.--Soil Productivity Ratings--Continued

Soil name and map symbol	Crop rating	Range rating	Productivity rating
EtD---------------------------- Ethan-Clarno	41.2	35.5	41.2
EuC---------------------------- Ethan-Egan	59.0	37.4	59.0
ExC---------------------------- Ethan-Egan	30.2	34.4	34.4
FaA---------------------------- Flandreau	77.2	44.9	77.2
FaB---------------------------- Flandreau	72.9	42.4	72.9
FtB---------------------------- Flandreau-Thurman	66.9	42.4	66.9
GrA---------------------------- Graceville	86.0	45.9	86.0
GsB---------------------------- Grovena	84.5	46.4	84.5
GvA---------------------------- Grovena-Bonilla	90.8	51.0	90.8
HoB---------------------------- Houdek	74.3	43.4	74.3
HsC---------------------------- Houdek-Shindler	62.3	40.4	62.3
HsD---------------------------- Houdek-Shindler	46.9	38.9	46.9
HtD---------------------------- Houdek-Talmo	33.1	31.7	33.1
HuA---------------------------- Huntimer	80.4	44.0	80.4
HuB---------------------------- Huntimer	74.6	43.0	74.6
IhA---------------------------- Ihlen	71.7	42.9	71.7
IrB---------------------------- Ihlen-Rock outcrop	47.6	30.0	47.6
IrE---------------------------- Ihlen-Rock outcrop	26.5	19.5	26.5
Ja----------------------------- Janude	68.6	45.4	68.6
La----------------------------- Lamo	61.4	73.2	73.2
Lb----------------------------- Lamo	27.4	57.1	57.1

Table 5.--Soil Productivity Ratings--Continued

Soil name and map symbol	Crop rating	Range rating	Productivity rating
M-W. Miscellaneous water			
MdB Moody	88.0	47.3	88.0
MgA Moody-Gayville	48.8	37.0	48.8
MnB Moody-Nora	87.2	46.9	87.2
MnC Moody-Nora	79.3	44.9	79.3
MtA Moody-Trent	96.7	54.7	96.7
NcC Nora-Crofton	68.3	41.3	68.3
Ob Obert	14.9	40.0	40.0
Og Orthents	12.8	12.2	12.8
Or Orthents	51.6	34.1	51.6
Ow Orthents-Aquents	14.1	15.1	15.1
Pt Pits, quarry	NS	NS	NS
Sa Salmo	20.2	54.6	54.6
SdE Shindler-Houdek	27.6	35.9	35.9
SnE Shindler-Talmo	16.5	26.9	26.9
SpA Splitrock	90.4	47.3	90.4
SpB Splitrock	83.2	45.9	83.2
SsF Steinauer-Shindler	8.8	30.9	30.9
TdE Talmo-Delmont	7.1	21.3	21.3
Te Tetonka	37.5	51.1	51.1
TfC Thurman-Flandreau	51.2	42.6	51.2

Table 5.--Soil Productivity Ratings--Continued

Soil name and map symbol	Crop rating	Range rating	Productivity rating
TgD---------------------------- Thurman-Grovena	45.0	41.6	45.0
Tr----------------------------- Trent	100.0	61.9	100.0
W. Water			
Wa----------------------------- Wakonda-Chancellor	71.9	57.2	71.9
WcA---------------------------- Wentworth-Chancellor-Wakonda	76.7	51.4	76.7
WhA---------------------------- Wentworth-Trent	88.3	51.1	83.3
WhB---------------------------- Wentworth-Trent	84.0	49.6	84.0
Wk----------------------------- Whitewood	74.4	61.4	74.4
Wo----------------------------- Worthing	15.3	39.7	39.7
Wr----------------------------- Worthing-Davison	37.3	45.7	45.7

Table 6.--Yields per Acre of Crops and Pasture

(Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil)

Soil name and map symbol	Corn	Spring wheat	Soybeans	Oats	Alfalfa hay	Bromegrass-alfalfa	Corn silage
	Bu	Bu	Bu	Bu	Tons	AUM*	Tons
AcA------------ Alcester	109	40	39	71	5.2	5.3	12.6
AcB------------ Alcester	106	40	38	71	4.5	4.7	12.2
Ar------------- Arlo	52	13	16	21	0.5	3.4	6.0
Ba------------- Baltic	30	4	10	6	---	0.6	3.2
Bb------------- Baltic	5	1	2	1	---	0.1	0.6
BcA------------ Benclare-Corson	96	37	35	64	4.2	4.3	11.0
BeE------------ Betts-Ethan	4	3	1	5	0.9	1.0	0.4
BfA------------ Blendon	75	31	27	55	3.7	3.9	8.6
BhB------------ Blendon-Henkin	67	29	25	50	3.5	3.7	7.7
Bo------------- Bon	100	35	36	62	3.7	4.6	11.5
Cb------------- Chancellor	85	29	32	51	2.2	4.1	9.0
Cc------------- Chancellor-Tetonka	76	23	28	41	1.6	3.3	8.0
Cd------------- Chaska	80	26	25	45	1.6	4.4	9.2
Ch------------- Chaska	40	6	14	11	0.5	2.9	4.6
Cm------------- Clamo	68	15	25	27	0.6	3.2	7.9
CoB------------ Corson	82	32	30	56	3.8	4.0	9.4
CoC------------ Corson	66	28	24	49	3.3	3.5	7.6
CpC------------ Corson-Henkin	54	24	18	41	3.0	3.2	6.3
CrD------------ Crofton-Nora	51	22	18	39	3.0	3.2	5.9

See footnote at end of table.

Table 6.--Yields per Acre of Crops and Pasture--Continued

Soil name and map symbol	Corn	Spring wheat	Soybeans	Oats	Alfalfa hay	Bromegrass-alfalfa	Corn silage
	Bu	Bu	Bu	Bu	Tons	AUM*	Tons
CrE------------- Crofton-Nora	18	9	6	16	2.1	2.3	2.1
CsD------------- Crofton-Shindler	36	17	11	29	2.5	2.7	4.2
DcA------------- Davis	106	40	38	71	4.5	4.9	12.2
DcB------------- Davis	99	38	36	67	4.6	4.7	11.4
DcC------------- Davis	86	34	31	60	4.2	4.3	9.8
Dd-------------- Davison-Crossplain	82	28	28	50	2.7	3.8	8.7
DeA------------- Delmont-Enet	44	22	16	38	2.7	2.8	5.0
DeB------------- Delmont-Enet	40	21	15	36	2.6	2.7	4.6
DgC------------- Delmont-Talmo	15	11	6	19	1.8	1.9	1.7
DgD------------- Delmont-Talmo	6	7	3	11	1.3	1.4	0.7
DmA------------- Dempster	73	32	27	56	3.6	3.7	8.4
DmB------------- Dempster	64	31	23	52	3.3	3.5	7.3
DtB------------- Dempster-Talmo	49	25	18	43	2.8	3.0	5.7
Dw-------------- Dimo	86	30	31	52	3.8	4.1	9.8
DxB------------- Dobalt	93	36	34	64	4.2	4.4	10.7
DyA------------- Dobalt-Bonilla	103	39	37	69	4.5	4.7	11.8
EaB------------- Egan-Ethan	80	34	29	59	3.7	3.9	8.5
EeB------------- Egan-Ethan-Trent	87	36	31	63	4.1	4.2	9.2
EfA------------- Egan-Trent	99	40	37	70	4.5	4.6	10.5

See footnote at end of table.

Table 6.--Yields per Acre of Crops and Pasture--Continued

Soil name and map symbol	Corn	Spring wheat	Soybeans	Oats	Alfalfa hay	Bromegrass-alfalfa	Corn silage
	Bu	Bu	Bu	Bu	Tons	AUM*	Tons
EgB------------ Egan-Wentworth-Trent	93	38	35	67	4.3	4.4	9.9
EnA------------ Enet	59	28	22	48	3.4	3.6	6.8
EoA------------ Enet-Dimo	71	29	26	50	3.6	3.8	8.1
EpD------------ Ethan-Betts	32	16	11	28	2.3	2.5	3.4
EsE. Ethan-Clarno							
EtD------------ Ethan-Clarno	40	19	14	34	2.6	2.8	4.2
EuC------------ Ethan-Egan	64	28	23	49	3.2	3.4	6.7
ExC------------ Ethan-Egan	34	14	12	25	1.6	1.7	3.5
FaA------------ Flandreau	87	35	32	61	3.9	4.1	10.3
FaB------------ Flandreau	81	33	30	58	3.8	4.0	9.3
FtB------------ Flandreau-Thurman	73	30	27	53	3.6	3.8	8.4
GrA------------ Graceville	99	39	36	68	4.3	4.5	11.4
GsB------------ Grovena	97	38	35	67	4.3	4.5	11.1
GvA------------ Grovena-Bonilla	106	40	38	71	4.6	4.8	12.1
HoB------------ Houdek	86	34	31	60	3.4	4.1	9.8
HsC------------ Houdek-Shindler	68	28	24	50	3.4	3.6	7.8
HsD------------ Houdek-Shindler	47	21	16	37	2.9	3.1	5.4
HtD------------ Houdek-Talmo	31	15	11	26	2.2	2.3	3.5
HuA------------ Huntimer	92	38	34	66	4.0	4.2	9.8

See footnote at end of table.

Table 6.--Yields per Acre of Crops and Pasture--Continued

Soil name and map symbol	Corn	Spring wheat	Soybeans	Oats	Alfalfa hay	Bromegrass-alfalfa	Corn silage
	Bu	Bu	Bu	Bu	Tons	AUM*	Tons
HuB------------- Huntimer	84	35	31	61	3.9	4.0	8.9
IhA------------- Ihlen	79	34	29	59	3.7	3.8	9.0
IrB:							
Ihlen----------	52	22	19	39	2.5	2.6	6.0
Rock outcrop.							
IrE:							
Ihlen----------	26	12	10	21	1.6	1.7	3.0
Rock outcrop.							
Ja-------------- Janude	75	31	27	55	3.7	3.9	8.6
La-------------- Lamo	80	26	25	45	4.1	4.4	9.2
Lb-------------- Lamo	40	7	12	11	0.5	2.9	4.6
M-W. Miscellaneous water							
MdB------------- Moody	103	39	37	69	4.4	4.6	11.8
MgA------------- Moody-Gayville	58	22	21	38	2.3	2.5	6.7
MnB------------- Moody-Nora	101	39	36	69	4.4	4.6	11.6
MnC------------- Moody-Nora	90	36	32	63	4.1	4.3	10.3
MtA------------- Moody-Trent	112	43	40	75	5.0	5.1	12.9
NcC------------- Nora-Crofton	76	31	26	54	3.7	3.9	8.7
Ob-------------- Obert	29	3	9	5	---	1.0	3.3
Og-------------- Orthents	6	6	2	11	1.2	1.3	0.7
Or-------------- Orthents	55	24	18	41	3.0	3.1	6.3
Ow-------------- Orthents-Aquents	15	5	6	9	0.8	1.1	1.7

See footnote at end of table.

Table 6.--Yields per Acre of Crops and Pasture--Continued

Soil name and map symbol	Corn	Spring wheat	Soybeans	Oats	Alfalfa hay	Bromegrass-alfalfa	Corn silage
	Bu	Bu	Bu	Bu	Tons	AUM*	Tons
Pt. Pits, quarry							
Sa-------------- Salmo	36	6	9	10	0.2	1.7	3.8
SdE------------- Shindler-Houdek	23	12	8	21	2.1	2.2	2.6
SnE------------- Shindler-Talmo	12	7	4	12	1.4	1.5	1.4
SpA------------- Splitrock	106	40	38	71	4.5	4.7	12.2
SpB------------- Splitrock	96	37	34	65	4.3	4.5	11.0
SsF------------- Steinauer-Shindler	4	3	1	5	1.0	1.1	0.5
TdE------------- Talmo-Delmont	2	3	1	4	0.8	0.9	0.3
Te-------------- Tetonka	60	13	22	23	0.6	2.0	6.3
TfC------------- Thurman-Flandreau	51	23	19	41	3.1	3.2	5.9
TgD------------- Thurman-Grovena	45	20	16	36	2.6	2.8	5.8
Tr-------------- Trent	114	43	41	76	5.5	5.5	13.1
W. Water							
Wa-------------- Wakonda-Chancellor	92	30	30	53	3.0	4.1	10.6
WcA------------- Wentworth-Chancellor-Wakonda	93	35	33	61	3.5	4.1	9.8
WhA------------- Wentworth-Trent	101	41	37	72	4.5	4.7	10.7
WhB------------- Wentworth-Trent	95	39	54	68	4.4	4.5	10.1
Wk-------------- Whitewood	96	31	34	55	2.5	4.4	11.0
Wo-------------- Worthing	30	4	11	7	---	0.6	3.2

See footnote at end of table.

Table 6.--Yields per Acre of Crops and Pasture--Continued

Soil name and map symbol	Corn	Spring wheat	Soybeans	Oats	Alfalfa hay	Bromegrass-alfalfa	Corn silage
	Bu	Bu	Bu	Bu	Tons	AUM*	Tons
Wr-------------- Worthing-Davison	53	15	18	25	1.4	1.9	5.6

* Animal unit month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

Table 7.--Prime Farmland

(Only the soils considered prime farmland are listed. Urban or built-up areas of the soils listed are not considered prime farmland. If a soil is prime farmland only under certain conditions, the conditions are specified in parentheses after the soil name)

Map symbol	Soil name
AcA	Alcester silty clay loam, 0 to 2 percent slopes
AcB	Alcester silty clay loam, 2 to 6 percent slopes
Ar	Arlo loam, 0 to 1 percent slopes (where drained)
BcA	Benclare-Corson complex, 0 to 2 percent slopes
BfA	Blendon fine sandy loam, 0 to 2 percent slopes
BhB	Blendon-Henkin fine sandy loams, 2 to 6 percent slopes
Bo	Bon loam, 0 to 2 percent slopes
Cb	Chancellor silty clay loam, 0 to 1 percent slopes (where drained)
Cc	Chancellor-Tetonka complex, 0 to 1 percent slopes (where drained)
Cd	Chaska loam, 0 to 2 percent slopes (where drained)
Cm	Clamo silty clay, 0 to 1 percent slopes (where drained)
CoB	Corson silty clay, 2 to 6 percent slopes
DcA	Davis loam, 0 to 2 percent slopes
DcB	Davis loam, 2 to 6 percent slopes
Dd	Davison-Crossplain clay loams, 0 to 2 percent slopes (where drained)
DeA	Delmont-Enet loams, 0 to 2 percent slopes (where irrigated)
DeB	Delmont-Enet loams, 2 to 6 percent slopes (where irrigated)
DmA	Dempster silt loam, 0 to 2 percent slopes
DmB	Dempster silt loam, 2 to 6 percent slopes
Dw	Dimo clay loam, 0 to 2 percent slopes
DxB	Dobalt loam, 2 to 6 percent slopes
DyA	Dobalt-Bonilla loams, 0 to 2 percent slopes
EaB	Egan-Ethan complex, 2 to 6 percent slopes
EeB	Egan-Ethan-Trent complex, 1 to 6 percent slopes
EfA	Egan-Trent silty clay loams, 0 to 2 percent slopes
EgB	Egan-Wentworth-Trent silty clay loams, 1 to 6 percent slopes
EnA	Enet loam, 0 to 2 percent slopes, rarely flooded
EoA	Enet-Dimo complex, 0 to 2 percent slopes
FaA	Flandreau loam, 0 to 2 percent slopes
FaB	Flandreau loam, 2 to 6 percent slopes
FtB	Flandreau-Thurman complex, 2 to 6 percent slopes
GrA	Graceville silty clay loam, 0 to 2 percent slopes
GsB	Grovena loam, 2 to 6 percent slopes
GvA	Grovena-Bonilla loams, 0 to 2 percent slopes
HoB	Houdek clay loam, 2 to 6 percent slopes
HuA	Huntimer silty clay loam, 0 to 2 percent slopes
HuB	Huntimer silty clay loam, 2 to 6 percent slopes
IhA	Ihlen silty clay loam, 0 to 2 percent slopes
Ja	Janude fine sandy loam, 0 to 2 percent slopes
La	Lamo silty clay loam, 0 to 1 percent slopes (where drained)
MdB	Moody silty clay loam, 2 to 6 percent slopes
MnB	Moody-Nora silty clay loams, 2 to 6 percent slopes
MtA	Moody-Trent silty clay loams, 0 to 2 percent slopes
SpA	Splitrock silty clay loam, 0 to 2 percent slopes
SpB	Splitrock silty clay loam, 2 to 6 percent slopes
Te	Tetonka silt loam, 0 to 1 percent slopes (where drained)
Tr	Trent silty clay loam, 0 to 2 percent slopes
Wa	Wakonda-Chancellor silty clay loams, 0 to 2 percent slopes (where drained)
WcA	Wentworth-Chancellor-Wakonda silty clay loams, 0 to 2 percent slopes
WhA	Wentworth-Trent silty clay loams, 0 to 2 percent slopes
WhB	Wentworth-Trent silty clay loams, 1 to 6 percent slopes
Wk	Whitewood silty clay loam, 0 to 2 percent slopes (where drained)

Table 8.--Rangeland Characteristic Vegetation and Productivity

(See text for definitions of terms used in this table)

Range site, soil name, and map symbols	Potential natural plant community: Common plant name	Composition	Potential annual production for kind of growing season: Favorable	Average	Unfavorable
		Pct	Lb/acre	Lb/acre	Lb/acre
Clayey	Little bluestem	30	4,000	3,300	2,300
Corson: BcA, CoB, CoC, CpC	Big bluestem	20			
	Needlegrasses	20			
	Western wheatgrass	5			
	Sideoats grama	5			
	Blue grama	5			
	Bluegrasses	5			
	Sedges	5			
	Climax forbs	5			
Limy Subirrigated	Little bluestem	40	5,300	4,400	3,100
Davison: Dd, Wr	Big bluestem	20			
Wakonda: Wa, WcA	Porcupinegrass	10			
	Switchgrass	10			
	Indiangrass	5			
	Sideoats grama	5			
	Sedges	5			
	Forbs	5			
Loamy Overflow	Big bluestem	55	5,600	4,800	3,300
Alcester: AcA	Switchgrass	10			
Benclare: BcA	Forbs	10			
Bon: Bo	Little bluestem	10			
Bonilla: DyA, GvA	Indiangrass	5			
Chancellor: Cb, Cc, Wa, WcA	Sideoats grama	5			
	Shrubs	5			
Crossplain: Dd					
Davis: DcA					
Dimo: Dw, EoA					
Enet: EnA, EoA					
Trent: EeB, EfA, EgB, MtA, Tr, WhA, WhB					
Whitewood: Wk					
Saline Lowland	Cordgrasses	60	4,200	3,800	3,000
Gayville: MgA	Nuttall alkaligrass	15			
	Inland saltgrass	10			
	Western wheatgrass	5			
	Sedges	5			
	Forbs	5			
Saline Subirrigated	Little bluestem	45	5,300	4,600	3,100
Salmo: Sa	Big bluestem	20			
	Indiangrass	10			
	Switchgrass	10			
	Bluegrass	5			
	Sedges	5			
	Forbs	5			
Sandy	Big bluestem or sand bluestem	30	4,100	3,400	2,300
Blendon: BfA, BhB	Little bluestem	20			
Henkin: BhB, CpC	Prairie sandreed	10			
Janude: Ja	Porcupinegrass	10			
Thurman: FtB, TfC, TgD	Needleandthread	10			
	Sideoats grama	5			
	Switchgrass	5			
	Sedges	5			
	Forbs	5			

Table 8.--Rangeland Characteristic Vegetation and Productivity--Continued

Range site, soil name, and map symbols	Potential natural plant community		Potential annual production for kind of growing season		
	Common plant name	Composition	Favorable	Average	Unfavorable
		Pct	Lb/acre	Lb/acre	Lb/acre
Shallow Marsh	Reedgrasses	35	7,500	6,800	5,400
Baltic: Ba	Slough sedge	35			
Worthing: Wo, Wr	Prairie cordgrass	10			
	Forbs	10			
	Common spikesedge	5			
	Cattail and bulrushes	5			
Shallow to Gravel	Needleandthread	30	3,100	2,600	1,500
Delmont: DeA, DeB, DgC, DgD, TdE	Little bluestem	15			
	Sideoats grama	10			
	Plains muhly	10			
	Sedges	10			
	Blue grama and hairy grama	10			
	Prairie dropseed	5			
	Forbs	5			
	Shrubs	5			
Silty	Little bluestem	30	4,800	4,000	2,800
Alcester: AcB	Needlegrasses	20			
Clarno: EsE, EtD	Big bluestem	15			
Davis: DcB, DcC	Forbs	10			
Dempster: DmA, DmB, DtB	Shrubs	10			
Dobalt: DxB, DyA	Prairie dropseed	5			
Egan: EaB, EeB, EfA, EgB, EuC, ExC	Switchgrass	5			
	Indiangrass	5			
Enet: DeA, DeB					
Flandreau: FaA, FaB, FtB, TfC					
Graceville: GrA					
Grovena: GsB, GvA, TgD					
Houdek: HoB, HsC, HsD, HtD, SdE					
Huntimer: HuA, HuB					
Ihlen: IhA, IrB, IrE					
Moody: MdB, MgA, MnB, MnC, MtA					
Nora: CrD, CrE, MnB, MnC, NcC					
Shindler: CsD, HsC, HsD, SdE, SnE, SsF					
Splitrock: SpA, SpB					
Wentworth: EgB, WcA, WhA, WhB					
Subirrigated	Big bluestem	60	5,900	5,100	3,600
Arlo: Ar	Forbs	15			
Chaska: Cd, Ch	Indiangrass	5			
Lamo: La, Lb	Switchgrass	5			
	Little bluestem	5			
	Prairie cordgrass	5			
	Sedges	5			
Thin Upland	Little bluestem	30	3,800	3,100	2,100
Betts: BeE, EpD	Big bluestem	10			
Crofton: CrD, CrE, CsD, NcC	Prairie dropseed	10			
	Sideoats grama	10			
Ethan: BeE, EaB, EeB, EpD, EsE, EtD, EuC, ExC	Forbs	10			
	Shrubs	10			
Orthents: Or	Plains muhly	5			
Steinauer: SsF	Needleandthread	5			
	Green needlegrass	5			
	Porcupinegrass	5			

Table 8.--Rangeland Characteristic Vegetation and Productivity--Continued

Range site, soil name, and map symbols	Potential natural plant community		Potential annual production for kind of growing season		
	Common plant name	Composition	Favorable	Average	Unfavorable
		Pct	Lb/acre	Lb/acre	Lb/acre
Very Shallow	Needleandthread	30	2,600	2,200	1,300
Orthents: Og, Ow	Sedges	15			
Talmo: DgC, DgD, DtB,	Blue grama and hairy grama	15			
HtD, SnE, TdE	Plains muhly	10			
	Sideoats grama	10			
	Forbs	10			
	Shrubs	10			
Wet Meadow	Sedges	40	5,700	5,200	3,400
Tetonka: Cc, Te	Reedgrasses	20			
	Prairie cordgrass	15			
	Reed canarygrass	5			
	Western wheatgrass	5			
	Rushes	5			
	Bluegrasses	5			
	Forbs	5			
Wetland	Prairie cordgrass	70	6,700	6,100	4,900
Aquents: Ow	Reed canarygrass	5			
Clamo: Cm	Reedgrasses	5			
Obert: Ob	Canada wildrye	5			
	Switchgrass	5			
	Bluegrasses	5			
	Sedges	5			

Table 9.--Windbreaks and Environmental Plantings

(In Minnehaha County, none of the soils are assigned to windbreak suitability group 7. Dashes indicate that trees generally do not grow to the given height on the soils in that group)

Windbreak suitability group, soil name, and map symbols	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
Group 1----------- Alcester: AcA Bon: Bo Bonilla: DyA, GvA Davis: DcA Dimo: Dw, EoA Janude: Ja Trent: EeB, EfA, EgB, MtA, Tr, WhA, WhB	American cranberrybush, golden currant, Hansen hedgerose, juneberry, false indigo, Mongolian cherry, Nanking cherry, Peking cotoneaster, redosier dogwood, Russian almond, skunkbush sumac, western sandcherry.	American plum, Amur honeysuckle, Amur maple, caragana, chokecherry, common lilac, European cotoneaster, late lilac, Manchurian apricot, nannyberry, sandbar willow, sea-buckthorn, Siberian apricot, silver buffaloberry.	Arnold hawthorn, Austrian pine, Black Hills spruce, black walnut, blue spruce, boxelder, bur oak, eastern redcedar, European birdcherry, laurel willow, littleleaf linden, Manchurian crabapple, ponderosa pine, Rocky Mountain juniper, Russian-olive, Scotch pine, Siberian crabapple, Ussurian pear.	Golden willow, green ash, hackberry, honeylocust, Siberian larch, silver maple, white poplar, white willow.	Carolina poplar, cottonwood, northwest poplar, robusta poplar, Siberian elm, Siouxland cottonwood.
Group 1K---------- Chaska: Cd, Ch Davison: Dd, Wr Wakonda: Wa, WcA	Golden currant, Hansen hedgerose, false indigo, Russian almond.	Amur honeysuckle, caragana, chokecherry, common lilac, late lilac, sandbar willow, sea-buckthorn, silver buffaloberry.	Arnold hawthorn, bur oak, eastern redcedar, laurel willow, Manchurian crabapple, ponderosa pine, Rocky Mountain juniper, Russian-olive.	Golden willow, green ash, hackberry, honeylocust, white poplar, white willow.	Cottonwood, Siberian elm.
Group 2----------- Chancellor: Cb, Cc, Wa, WcA Crossplain: Dd Whitewood: Wk	American cranberrybush, false indigo, redosier dogwood, sandbar willow.	Nannyberry, Russian-olive.	Laurel willow, white willow.	Golden willow, green ash.	Carolina poplar, cottonwood, northwest poplar, robusta poplar, Siouxland cottonwood.
Group 2K---------- Lamo: La, Lb	Sandbar willow----	Russian-olive-----	Laurel willow, white willow.	Golden willow, green ash.	Cottonwood.

Table 9.--Windbreaks and Environmental Plantings--Continued

Windbreak suitability group, soil name, and map symbols	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
Group 3----------- Alcester: AcB Clarno: EtD Davis: DcB, DcC Dobalt: DxB, DyA Egan: EaB, EeB, EfA, EgB, EuC, ExC Flandreau: FaA, FaB, FtB, TfC Graceville: GrA Grovena: GsB, GvA, TgD Houdek: HoB, HsC, HsD, HtD Huntimer: HuA, HuB Moody: MdB, MgA, MnB, MnC, MtA Nora: CrD, MnB, MnC, NcC Splitrock: SpA, SpB Wentworth: EgB, WcA, WhA, WhB	False indigo, golden currant, Hansen hedgerose, juneberry, late lilac, Mongolian cherry, Nanking cherry, Peking cotoneaster, redosier dogwood, Russian almond, sandbar willow, skunkbush sumac, western sandcherry.	American plum, Amur honeysuckle, Amur maple, Arnold hawthorn, caragana, chokecherry, common lilac, eastern redcedar, European cotoneaster, Manchurian apricot, nannyberry, Rocky Mountain juniper, sea-buckthorn, Siberian apricot, silver buffaloberry.	Austrian pine, Black Hills spruce, black walnut, blue spruce, boxelder, bur oak, European birdcherry, green ash, hackberry, littleleaf linden, Manchurian crabapple, ponderosa pine, Russian-olive, Scotch pine, Siberian crabapple, Siberian larch, Ussurian pear, white poplar.	Honeylocust, Siberian elm, silver maple.	---
Groups 4 and 4C--- Benclare: BcA Corson: BcA, CoB, CoC, CpC	American plum, Amur honeysuckle, caragana, common lilac, European cotoneaster, golden currant, Hansen hedgerose, juneberry, late lilac, Mongolian cherry, Nanking cherry, Peking cotoneaster, Russian almond, silver buffaloberry, skunkbush sumac.	Arnold hawthorn, chokecherry, eastern redcedar, Manchurian apricot, Manchurian crabapple, nannyberry, Rocky Mountain juniper, sea-buckthorn, Siberian apricot, Siberian crabapple.	Black Hills spruce, blue spruce, bur oak, green ash, hackberry, ponderosa pine, Russian-olive, Scotch pine.	Siberian elm------	---
Group 5----------- Blendon: BfA, BhB Henkin: BhB, CpC Thurman: FtB, TfC, TgD	American plum, Amur honeysuckle, European cotoneaster, golden currant, Hansen hedgerose, Mongolian cherry, Nanking cherry, Peking cotoneaster, Russian almond, sea-buckthorn, silver buffaloberry, skunkbush sumac, western sandcherry.	Amur maple, Arnold hawthorn, caragana, chokecherry, common lilac, eastern redcedar, Manchurian apricot, nannyberry, Rocky Mountain juniper, Siberian apricot, Ussurian pear.	Black Hills spruce, blue spruce, bur oak, green ash, hackberry, honeylocust, Manchurian crabapple, ponderosa pine, Russian-olive, Scotch pine, Siberian crabapple, Siberian larch.	Siberian elm------	---

Table 9.--Windbreaks and Environmental Plantings--Continued

Windbreak suitability group, soil name, and map symbols	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
Groups 6D and 6G-- Delmont: DeA, DeB, DgC Dempster: DmA, DmB, DtB Enet: DeA, DeB, EnA, EoA Ihlen: IhA, IrB, IrE	Caragana, chokecherry, common lilac, Hansen hedgerose, Peking cotoneaster, silver buffaloberry, skunkbush sumac, western sandcherry.	Arnold hawthorn, eastern redcedar, hackberry, Manchurian crabapple, Rocky Mountain juniper, Russian-olive, Siberian crabapple.	Green ash, honeylocust, ponderosa pine, Scotch pine.	Siberian elm------	---
Group 8----------- Betts: EpD Crofton: CrD, CsD, NcC Ethan: EaB, EeB, EpD, EtD, EuC Orthents: Or Shindler: CsD, HsC, HsD	Amur honeysuckle, caragana, common lilac, golden currant, Peking cotoneaster, sea-buckthorn, silver buffaloberry, skunkbush sumac.	Eastern redcedar, hackberry, Rocky Mountain juniper, Russian-olive.	Green ash, honeylocust, ponderosa pine, Siberian elm.	---	---
Group 9W---------- Gayville: MgA	Caragana, common lilac, golden currant, silver buffaloberry, skunkbush sumac.	Eastern redcedar, green ash, ponderosa pine, Rocky Mountain juniper, Russian-olive, Siberian elm.	---	---	---
Group 10---------- Aquents: Ow Arlo: Ar Baltic: Ba, Bb Betts: BeE Clarno: EsE Clamo: Cm Crofton: CrE Delmont: DgD, TdE Ethan: BeE, EsE, ExC Houdek: SdE Nora: CrE Obert: Ob Orthents: Og, Ow Pits: Pt Rock outcrop: IrB, IrE Salmo: Sa Shindler: SdE, SnE, SsF Steinauer: SsF Talmo: DgC, DgD, DtB, HtD, SnE, TdE Tetonka: Cc, Te Worthing: Wo, Wr	---	---	---	---	---

Table 10.--Recreational Development

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. See text for definitions of terms used in this table. Absence of an entry indicates that no rating is applicable)

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
AcA: Alcester	Severe: flooding.	Slight	Slight	Slight.
AcB: Alcester	Slight	Slight	Moderate: slope.	Slight.
Ar: Arlo	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Ba, Bb: Baltic	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
BcA:				
Benclare	Slight	Slight	Slight	Slight.
Corson	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.
BeE:				
Betts	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Ethan	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
BfA: Blendon	Slight	Slight	Slight	Slight.
BhB:				
Blendon	Slight	Slight	Moderate: slope.	Slight.
Henkin	Slight	Slight	Moderate: slope, small stones.	Slight.
Bo: Bon	Severe: flooding.	Slight	Moderate: flooding.	Slight.
Cb: Chancellor	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.
Cc:				
Chancellor	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.
Tetonka	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Cd: Chaska	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Ch: Chaska	Severe: flooding.	Moderate: flooding, wetness.	Severe: flooding.	Moderate: wetness, flooding.

Table 10.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Cm---------------------- Clamo	Severe: flooding, too clayey.	Severe: wetness, too clayey.	Severe: too clayey, wetness.	Severe: wetness, too clayey.
CoB--------------------- Corson	Moderate: too clayey.	Moderate: too clayey.	Moderate: slope, too clayey.	Moderate: too clayey.
CoC--------------------- Corson	Moderate: too clayey.	Moderate: too clayey.	Severe: slope.	Moderate: too clayey.
CpC:				
Corson-----------------	Moderate: too clayey.	Moderate: too clayey.	Severe: slope.	Moderate: too clayey.
Henkin-----------------	Slight---------	Slight---------	Severe: slope.	Slight.
CrD:				
Crofton----------------	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.
Nora-------------------	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
CrE:				
Crofton----------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.
Nora-------------------	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
CsD:				
Crofton----------------	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.
Shindler---------------	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
DcA--------------------- Davis	Severe: wetness.	Slight---------	Moderate: wetness.	Slight.
DcB--------------------- Davis	Slight---------	Slight---------	Moderate: slope.	Slight.
DcC--------------------- Davis	Slight---------	Slight---------	Severe: slope.	Slight.
Dd:				
Davison----------------	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
Crossplain-------------	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.
DeA:				
Delmont----------------	Slight---------	Slight---------	Slight---------	Slight.
Enet-------------------	Slight---------	Slight---------	Slight---------	Slight.

Table 10.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
DeB:				
Delmont	Slight	Slight	Moderate: slope.	Slight.
Enet	Slight	Slight	Moderate: slope.	Slight.
DgC:				
Delmont	Slight	Slight	Severe: slope.	Slight.
Talmo	Moderate: small stones.	Moderate: small stones.	Severe: slope, small stones.	Slight.
DgD:				
Delmont	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Talmo	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight.
DmA Dempster	Slight	Slight	Slight	Slight.
DmB Dempster	Slight	Slight	Moderate: slope.	Slight.
DtB:				
Dempster	Slight	Slight	Moderate: slope.	Slight.
Talmo	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight.
Dw Dimo	Severe: flooding.	Moderate: wetness.	Moderate: wetness, flooding.	Moderate: wetness.
DxB Dobalt	Slight	Slight	Moderate: slope.	Slight.
DyA:				
Dobalt	Slight	Slight	Slight	Slight.
Bonilla	Severe: wetness.	Slight	Moderate: wetness.	Slight.
EaB:				
Egan	Slight	Slight	Moderate: slope.	Slight.
Ethan	Slight	Slight	Moderate: slope.	Slight.
EeB:				
Egan	Slight	Slight	Moderate: slope.	Slight.
Ethan	Slight	Slight	Moderate: slope.	Slight.
Trent	Severe: wetness.	Slight	Moderate: wetness.	Slight.

Table 10.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
EfA:				
Egan	Slight	Slight	Slight	Slight.
Trent	Severe: wetness.	Slight	Moderate: wetness.	Slight.
EgB:				
Egan	Slight	Slight	Moderate: slope.	Slight.
Wentworth	Slight	Slight	Moderate: slope.	Slight.
Trent	Severe: wetness.	Slight	Moderate: wetness.	Slight.
EnA Enet	Severe: flooding.	Slight	Slight	Slight.
EoA:				
Enet	Severe: flooding.	Slight	Slight	Slight.
Dimo	Severe: flooding.	Moderate: wetness.	Moderate: wetness, flooding.	Moderate: wetness.
EpD:				
Ethan	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Betts	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
EsE:				
Ethan	Severe: slope.	Severe: slope.	Severe: large stones, slope.	Moderate: large stones, slope.
Clarno	Moderate: slope, large stones.	Moderate: slope, large stones.	Severe: large stones, slope.	Moderate: large stones.
EtD:				
Ethan	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Clarno	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
EuC:				
Ethan	Slight	Slight	Severe: slope.	Slight.
Egan	Slight	Slight	Severe: slope.	Slight.
ExC:				
Ethan	Moderate: large stones.	Moderate: large stones.	Severe: large stones, slope.	Moderate: large stones.
Egan	Slight	Slight	Moderate: slope.	Slight.

Table 10.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
FaA Flandreau	Slight	Slight	Slight	Slight.
FaB Flandreau	Slight	Slight	Moderate: slope.	Slight.
FtB:				
Flandreau	Slight	Slight	Moderate: slope.	Slight.
Thurman	Slight	Slight	Moderate: slope.	Slight.
GrA Graceville	Severe: wetness.	Slight	Slight	Slight.
GsB Grovena	Slight	Slight	Moderate: slope.	Slight.
GvA:				
Grovena	Slight	Slight	Slight	Slight.
Bonilla	Severe: wetness.	Slight	Moderate: wetness.	Slight.
HoB Houdek	Slight	Slight	Moderate: slope.	Slight.
HsC:				
Houdek	Slight	Slight	Severe: slope.	Slight.
Shindler	Slight	Slight	Severe: slope.	Slight.
HsD:				
Houdek	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Shindler	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
HtD:				
Houdek	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Talmo	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight.
HuA Huntimer	Slight	Slight	Slight	Slight.
HuB Huntimer	Slight	Slight	Moderate: slope.	Slight.
IhA Ihlen	Slight	Slight	Slight	Slight.
IrB:				
Ihlen	Slight	Slight	Moderate: slope, depth to rock.	Slight.

Table 10.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
IrB:				
Rock outcrop	Severe: small stones, depth to rock.	Severe: small stones, depth to rock.	Severe: small stones, depth to rock.	Severe: small stones.
IrE:				
Ihlen	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Rock outcrop	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: small stones.
Ja Janude	Severe: flooding.	Slight	Slight	Slight.
La Lamo	Severe: flooding, wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.
Lb Lamo	Severe: flooding, wetness.	Moderate: flooding, wetness, percs slowly.	Severe: wetness, flooding.	Moderate: wetness, flooding.
M-W. Miscellaneous water				
MdB Moody	Slight	Slight	Moderate: slope.	Slight.
MgA:				
Moody	Slight	Slight	Slight	Slight.
Gayville	Severe: flooding, excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Slight.
MnB:				
Moody	Slight	Slight	Moderate: slope.	Slight.
Nora	Slight	Slight	Moderate: slope.	Slight.
MnC:				
Moody	Slight	Slight	Severe: slope.	Slight.
Nora	Slight	Slight	Severe: slope.	Slight.
MtA:				
Moody	Slight	Slight	Slight	Slight.
Trent	Severe: wetness.	Slight	Moderate: wetness.	Slight.
NcC:				
Nora	Slight	Slight	Severe: slope.	Slight.
Crofton	Slight	Slight	Severe: slope.	Severe: erodes easily.

Table 10.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Ob: Obert	Severe: flooding, ponding.	Severe: ponding.	Severe: ponding, flooding.	Severe: ponding.
Og: Orthents	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.
Or: Orthents	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Slight.
Ow:				
Orthents	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.
Aquents	Severe: ponding.	Severe: ponding.	Severe: small stones, ponding.	Severe: ponding.
Pt: Pits, quarry	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones.
Sa: Salmo	Severe: flooding, wetness, excess salt.	Severe: wetness, excess salt.	Severe: wetness, flooding, excess salt.	Severe: wetness.
SdE:				
Shindler	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Houdek	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
SnE:				
Shindler	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Talmo	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.
SpA: Splitrock	Slight	Slight	Slight	Slight.
SpB: Splitrock	Slight	Slight	Moderate: slope.	Slight.
SsF:				
Steinauer	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Shindler	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
TdE:				
Talmo	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.
Delmont	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.

Table 10.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Te: Tetonka	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
TfC:				
Thurman	Slight	Slight	Severe: slope.	Slight.
Flandreau	Slight	Slight	Severe: slope.	Slight.
TgD:				
Thurman	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Grovena	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Tr: Trent	Severe: wetness.	Slight	Moderate: wetness.	Slight.
W. Water				
Wa:				
Wakonda	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Slight.
Chancellor	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.
WcA:				
Wentworth	Slight	Slight	Slight	Slight.
Chancellor	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.
Wakonda	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Slight.
WhA:				
Wentworth	Slight	Slight	Slight	Slight.
Trent	Severe: wetness.	Slight	Moderate: wetness.	Slight.
WhB:				
Wentworth	Slight	Slight	Moderate: slope.	Slight.
Trent	Severe: wetness.	Slight	Moderate: wetness.	Slight.
Wk: Whitewood	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.
Wo: Worthing	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.

Table 10.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Wr:				
Worthing	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Davison	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.

Table 11.--Wildlife Habitat

(See text for definitions of terms used in this table. Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Potential for habitat elements								
	Grain and seed crops	Grasses and legumes	Native herba- ceous plants	Planted woody plants	Native decid- uous trees	Native conif- erous plants	Native shrubs	Wetland plants	Shallow water areas
AcA: Alcester	Good	Good	Good	Good	Fair	Poor	Poor	Very poor.	Poor.
AcB: Alcester	Good	Good	Good	Good	Fair	Poor	Poor	Very poor.	Very poor.
Ar: Arlo	Poor	Poor	Fair	Very poor.	Poor	Poor	Poor	Fair	Fair.
Ba: Baltic	Very poor.	Poor	Poor	Very poor.	Poor	Very poor.	Very poor.	Good	Good.
Bb: Baltic	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Good	Good.
BcA:									
Benclare	Good	Good	Good	Good	Poor	Poor	Poor	Very poor.	Very poor.
Corson	Good	Fair	Good	Fair	Poor	Poor	Poor	Very poor.	Very poor.
BeE:									
Betts	Very poor.	Very poor.	Fair	Very poor.	Fair	Poor	Poor	Very poor.	Very poor.
Ethan	Very poor.	Very poor.	Fair	Very poor.	Fair	Poor	Poor	Very poor.	Very poor.
BfA: Blendon	Good	Fair	Good	Fair	Poor	Poor	Poor	Very poor.	Very poor.
BhB:									
Blendon	Fair	Fair	Good	Fair	Poor	Poor	Poor	Very poor.	Very poor.
Henkin	Fair	Fair	Good	Fair	Poor	Poor	Poor	Very poor.	Very poor.
Bo: Bon	Good	Good	Good	Good	Fair	Poor	Poor	Very poor.	Poor.
Cb: Chancellor	Good	Good	Good	Good	Poor	Poor	Poor	Poor	Fair.
Cc:									
Chancellor	Good	Good	Good	Good	Poor	Poor	Poor	Poor	Fair.
Tetonka	Poor	Poor	Fair	Very poor.	Poor	Very poor.	Poor	Fair	Fair.
Cd: Chaska	Good	Good	Fair	Good	Fair	Poor	Fair	Poor	Fair.
Ch: Chaska	Very poor.	Very poor.	Fair	Good	Good	Poor	Good	Fair	Fair.
Cm: Clamo	Poor	Poor	Good	Very poor.	Fair	Poor	Fair	Fair	Fair.

Table 11.--Wildlife Habitat--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Native herbaceous plants	Planted woody plants	Native deciduous trees	Native coniferous plants	Native shrubs	Wetland plants	Shallow water areas
CoB, CoC-----------Corson	Fair	Fair	Good	Fair	Poor	Poor	Poor	Very poor.	Very poor.
CpC:									
Corson------------	Fair	Fair	Good	Fair	Poor	Poor	Poor	Very poor.	Very poor.
Henkin------------	Poor	Fair	Good	Fair	Poor	Poor	Poor	Very poor.	Very poor.
CrD:									
Crofton-----------	Very poor.	Fair	Good	Poor	Poor	Poor	Poor	Very poor.	Very poor.
Nora--------------	Poor	Good	Good	Poor	Poor	Poor	Poor	Very poor.	Very poor.
CrE:									
Crofton-----------	Very poor.	Very poor.	Fair	Very poor.	Fair	Poor	Fair	Very poor.	Very poor.
Nora--------------	Very poor.	Very poor.	Good	Very poor.	Fair	Poor	Fair	Very poor.	Very poor.
CsD:									
Crofton-----------	Very poor.	Very poor.	Fair	Poor	Poor	Poor	Poor	Very poor.	Very poor.
Shindler----------	Very poor.	Poor	Good	Poor	Poor	Poor	Poor	Very poor.	Very poor.
DcA----------------Davis	Good	Good	Good	Good	Fair	Poor	Fair	Very poor.	Poor.
DcB----------------Davis	Good	Good	Good	Good	Fair	Poor	Fair	Very poor.	Very poor.
DcC----------------Davis	Fair	Good	Good	Fair	Fair	Poor	Fair	Very poor.	Very poor.
Dd:									
Davison-----------	Good	Good	Fair	Good	Poor	Poor	Poor	Very poor.	Poor.
Crossplain--------	Good	Good	Good	Good	Poor	Poor	Poor	Poor	Fair.
DeA:									
Delmont-----------	Fair	Fair	Poor	Poor	Poor	Poor	Poor	Very poor.	Very poor.
Enet--------------	Good	Fair	Good	Poor	Poor	Poor	Poor	Very poor.	Very poor.
DeB:									
Delmont-----------	Poor	Fair	Poor	Poor	Poor	Poor	Poor	Very poor.	Very poor.
Enet--------------	Fair	Fair	Good	Poor	Poor	Poor	Poor	Very poor.	Very poor.

Table 11.--Wildlife Habitat--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Native herbaceous plants	Planted woody plants	Native deciduous trees	Native coniferous plants	Native shrubs	Wetland plants	Shallow water areas
DgC:									
Delmont	Poor	Fair	Poor	Poor	Poor	Poor	Poor	Very poor.	Very poor.
Talmo	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
DgD:									
Delmont	Very poor.	Very poor.	Poor	Very poor.	Poor	Poor	Poor	Very poor.	Very poor.
Talmo	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
DmA: Dempster	Good	Fair	Good	Poor	Poor	Poor	Poor	Very poor.	Very poor.
DmB: Dempster	Fair	Fair	Good	Poor	Poor	Poor	Poor	Very poor.	Very poor.
DtB:									
Dempster	Fair	Fair	Good	Poor	Poor	Poor	Poor	Very poor.	Very poor.
Talmo	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Dw: Dimo	Good	Good	Good	Good	Poor	Poor	Poor	Poor	Poor.
DxB: Dobalt	Good	Good	Good	Good	Poor	Poor	Poor	Very poor.	Very poor.
DyA:									
Dobalt	Good	Good	Good	Good	Poor	Poor	Poor	Very poor.	Very poor.
Bonilla	Good	Good	Good	Good	Poor	Poor	Poor	Very poor.	Very poor.
EaB:									
Egan	Good	Good	Good	Good	Poor	Poor	Poor	Very poor.	Very poor.
Ethan	Fair	Fair	Fair	Poor	Poor	Poor	Poor	Very poor.	Very poor.
EeB:									
Egan	Good	Good	Good	Good	Poor	Poor	Poor	Very poor.	Very poor.
Ethan	Fair	Fair	Fair	Poor	Poor	Poor	Poor	Very poor.	Very poor.
Trent	Good	Good	Good	Good	Poor	Poor	Poor	Very poor.	Very poor.
EfA:									
Egan	Good	Good	Good	Good	Poor	Poor	Poor	Very poor.	Very poor.
Trent	Good	Good	Good	Good	Poor	Poor	Poor	Very poor.	Very poor.

Table 11.--Wildlife Habitat--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Native herba-ceous plants	Planted woody plants	Native decid-uous trees	Native conif-erous plants	Native shrubs	Wetland plants	Shallow water areas
EgB:									
Egan	Good	Good	Good	Good	Poor	Poor	Poor	Very poor.	Very poor.
Wentworth	Good	Good	Good	Good	Poor	Poor	Poor	Very poor.	Very poor.
Trent	Good	Good	Good	Good	Poor	Poor	Poor	Very poor.	Very poor.
EnA Enet	Good	Fair	Good	Poor	Poor	Poor	Poor	Very poor.	Very poor.
EoA:									
Enet	Good	Fair	Good	Poor	Poor	Poor	Poor	Very poor.	Very poor.
Dimo	Good	Good	Good	Good	Poor	Poor	Poor	Poor	Poor.
EpD:									
Ethan	Very poor.	Very poor.	Fair	Poor	Poor	Poor	Poor	Very poor.	Very poor.
Betts	Very poor.	Very poor.	Fair	Poor	Poor	Poor	Poor	Very poor.	Very poor.
EsE:									
Ethan	Very poor.	Very poor.	Fair	Very poor.	Poor	Poor	Fair	Very poor.	Very poor.
Clarno	Very poor.	Very poor.	Good	Very poor.	Poor	Poor	Fair	Very poor.	Very poor.
EtD:									
Ethan	Very poor.	Very poor.	Fair	Poor	Poor	Poor	Poor	Very poor.	Very poor.
Clarno	Poor	Good	Good	Poor	Poor	Poor	Poor	Very poor.	Very poor.
EuC:									
Ethan	Poor	Fair	Fair	Poor	Poor	Poor	Poor	Very poor.	Very poor.
Egan	Fair	Good	Good	Fair	Poor	Poor	Poor	Very poor.	Very poor.
ExC:									
Ethan	Very poor.	Very poor.	Fair	Very poor.	Poor	Poor	Poor	Very poor.	Very poor.
Egan	Good	Good	Good	Fair	Poor	Poor	Poor	Very poor.	Very poor.
FaA, FaB Flandreau	Good	Good	Good	Good	Poor	Poor	Poor	Very poor.	Very poor.
FtB:									
Flandreau	Good	Good	Good	Good	Poor	Poor	Poor	Very poor.	Very poor.
Thurman	Fair	Fair	Good	Fair	Poor	Poor	Poor	Very poor.	Very poor.

Table 11.--Wildlife Habitat--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Native herbaceous plants	Planted woody plants	Native deciduous trees	Native coniferous plants	Native shrubs	Wetland plants	Shallow water areas
GrA: Graceville	Good	Good	Good	Good	Poor	Poor	Poor	Very poor.	Very poor.
GsB: Grovena	Good	Good	Good	Good	Poor	Poor	Poor	Very poor.	Very poor.
GvA:									
Grovena	Good	Good	Good	Good	Poor	Poor	Poor	Very poor.	Very poor.
Bonilla	Good	Good	Good	Good	Poor	Poor	Poor	Very poor.	Very poor.
HoB: Houdek	Good	Good	Good	Good	Poor	Poor	Poor	Very poor.	Very poor.
HsC:									
Houdek	Fair	Good	Good	Fair	Poor	Poor	Poor	Very poor.	Very poor.
Shindler	Poor	Fair	Good	Poor	Poor	Poor	Poor	Very poor.	Very poor.
HsD:									
Houdek	Poor	Good	Good	Poor	Fair	Poor	Fair	Very poor.	Very poor.
Shindler	Very poor.	Fair	Good	Poor	Fair	Poor	Fair	Very poor.	Very poor.
HtD:									
Houdek	Poor	Good	Good	Poor	Fair	Poor	Fair	Very poor.	Very poor.
Talmo	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
HuA, HuB: Huntimer	Good	Good	Good	Good	Poor	Poor	Poor	Very poor.	Good.
IhA: Ihlen	Good	Good	Good	Fair	Poor	Poor	Poor	Very poor.	Very poor.
IrB:									
Ihlen	Good	Good	Good	Fair	Fair	Fair	Fair	Poor	Very poor.
Rock outcrop.									
IrE:									
Ihlen	Poor	Good	Good	Fair	Good	Fair	Good	Very poor.	Very poor.
Rock outcrop.									
Ja: Janude	Good	Good	Good	Good	Fair	Poor	Fair	Very poor.	Poor.
La: Lamo	Good	Good	Fair	Good	Fair	Poor	Fair	Poor	Fair.
Lb: Lamo	Very poor.	Very poor.	Fair	Good	Good	Poor	Good	Fair	Fair.

Table 11.--Wildlife Habitat--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Native herbaceous plants	Planted woody plants	Native deciduous trees	Native coniferous plants	Native shrubs	Wetland plants	Shallow water areas
M-W. Miscellaneous water									
MdB: Moody	Good	Good	Good	Good	Poor	Poor	Poor	Very poor.	Very poor.
MgA:									
Moody	Good	Good	Good	Good	Poor	Poor	Poor	Very poor.	Very poor.
Gayville	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Poor	Poor	Poor.
MnB:									
Moody	Good	Good	Good	Good	Poor	Poor	Poor	Very poor.	Very poor.
Nora	Good	Good	Good	Good	Poor	Poor	Poor	Very poor.	Very poor.
MnC:									
Moody	Fair	Good	Good	Fair	Poor	Poor	Poor	Very poor.	Very poor.
Nora	Fair	Good	Good	Fair	Poor	Poor	Poor	Very poor.	Very poor.
MtA:									
Moody	Good	Good	Good	Good	Poor	Poor	Poor	Very poor.	Very poor.
Trent	Good	Good	Good	Good	Poor	Poor	Poor	Very poor.	Very poor.
NcC:									
Nora	Fair	Good	Good	Fair	Poor	Poor	Poor	Very poor.	Very poor.
Crofton	Poor	Fair	Fair	Poor	Poor	Poor	Poor	Very poor.	Very poor.
Ob: Obert	Very poor.	Poor	Poor	Very poor.	Fair	Poor	Fair	Fair	Fair.
Og: Orthents	Very poor.	Very poor.	Poor	Very poor.	Poor	Poor	Poor	Very poor.	Very poor.
Or: Orthents	Poor	Fair	Fair	Poor	Poor	Poor	Poor	Very poor.	Very poor.
Ow:									
Orthents	Very poor.	Very poor.	Poor	Very poor.	Poor	Poor	Poor	Very poor.	Very poor.
Aquents	Very poor.	Very poor.	Poor	Very poor.	Fair	Poor	Poor	Fair	Good.
Pt: Pits, quarry	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Sa: Salmo	Poor	Poor	Fair	Very poor.	Poor	Very poor.	Poor	Fair	Fair.

Table 11.--Wildlife Habitat--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Native herbaceous plants	Planted woody plants	Native deciduous trees	Native coniferous plants	Native shrubs	Wetland plants	Shallow water areas
SdE:									
Shindler	Very poor.	Very poor.	Good	Very poor.	Fair	Poor	Fair	Very poor.	Very poor.
Houdek	Very poor.	Very poor.	Good	Very poor.	Fair	Poor	Fair	Very poor.	Very poor.
SnE:									
Shindler	Very poor.	Very poor.	Good	Very poor.	Fair	Poor	Fair	Very poor.	Very poor.
Talmo	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
SpA, SpB: Splitrock	Good	Good	Good	Good	Poor	Poor	Poor	Very poor.	Very poor.
SsF:									
Steinauer	Very poor.	Very poor.	Fair	Very poor.	Good	Fair	Fair	Very poor.	Very poor.
Shindler	Very poor.	Very poor.	Good	Very poor.	Good	Fair	Fair	Very poor.	Very poor.
TdE:									
Talmo	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Delmont	Very poor.	Very poor.	Poor	Very poor.	Poor	Poor	Poor	Very poor.	Very poor.
Te: Tetonka	Poor	Poor	Fair	Very poor.	Poor	Poor	Poor	Fair	Fair.
TfC:									
Thurman	Poor	Fair	Good	Fair	Poor	Poor	Poor	Very poor.	Very poor.
Flandreau	Fair	Good	Good	Fair	Poor	Poor	Poor	Very poor.	Very poor.
TgD:									
Thurman	Poor	Fair	Good	Poor	Poor	Poor	Poor	Very poor.	Very poor.
Grovena	Poor	Good	Good	Poor	Poor	Poor	Poor	Very poor.	Very poor.
Tr: Trent	Good	Good	Good	Good	Fair	Poor	Poor	Very poor.	Very poor.
W. Water									
Wa:									
Wakonda	Good	Good	Fair	Good	Poor	Poor	Poor	Very poor.	Poor.
Chancellor	Good	Good	Good	Good	Poor	Poor	Poor	Poor	Poor.

Table 11.--Wildlife Habitat--Continued

Soil name and map symbol	Potential for habitat elements								
	Grain and seed crops	Grasses and legumes	Native herba-ceous plants	Planted woody plants	Native decid-uous trees	Native conif-erous plants	Native shrubs	Wetland plants	Shallow water areas
WcA:									
Wentworth	Good	Good	Good	Good	Poor	Poor	Poor	Very poor.	Very poor.
Chancellor	Good	Good	Good	Good	Poor	Poor	Poor	Poor	Poor.
Wakonda	Good	Good	Fair	Good	Poor	Poor	Poor	Very poor.	Poor.
WhA, WhB:									
Wentworth	Good	Good	Good	Good	Poor	Poor	Poor	Very poor.	Very poor.
Trent	Good	Good	Good	Good	Fair	Poor	Poor	Very poor.	Very poor.
Wk Whitewood	Good	Good	Poor	Good	Fair	Poor	Poor	Poor	Fair.
Wo Worthing	Very poor.	Poor	Poor	Very poor.	Poor	Very poor.	Poor	Good	Good.
Wr:									
Worthing	Very poor.	Poor	Poor	Very poor.	Poor	Very poor.	Poor	Good	Good.
Davison	Good	Good	Fair	Good	Poor	Poor	Poor	Very poor.	Poor.

Table 12.--Building Site Development

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. See text for definitions of terms used in this table. Absence of an entry indicates that no rating is applicable)

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
AcA: Alcester	Moderate: wetness.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, frost action.
AcB: Alcester	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.
Ar: Arlo	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding, frost action.
Ba, Bb: Baltic	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.
BcA:					
Benclare	Moderate: too clayey, wetness.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
Corson	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
BeE:					
Betts	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.
Ethan	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.
BfA: Blendon	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.
BhB:					
Blendon	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Moderate: frost action.
Henkin	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Moderate: frost action.
Bo: Bon	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
Cb: Chancellor	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.
Cc:					
Chancellor	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.

Table 12.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Cc:					
Tetonka	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.
Cd Chaska	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding, frost action.
Ch Chaska	Severe: cutbanks cave, wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding, frost action.
Cm Clamo	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.
CoB, CoC Corson	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
CpC:					
Corson	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
Henkin	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Moderate: frost action.
CrD:					
Crofton	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength.
Nora	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.
CrE:					
Crofton	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.
Nora	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.
CsD:					
Crofton	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength.
Shindler	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.
DcA Davis	Moderate: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, wetness.

Table 12.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
DcB, DcC: Davis	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
Dd:					
Davison	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: frost action.
Crossplain	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.
DeA:					
Delmont	Severe: cutbanks cave.	Slight	Slight	Slight	Slight.
Enet	Severe: cutbanks cave.	Slight	Slight	Slight	Slight.
DeB:					
Delmont	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight.
Enet	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight.
DgC:					
Delmont	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight.
Talmo	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight.
DgD:					
Delmont	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.
Talmo	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.
DmA: Dempster	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight	Moderate: shrink-swell.	Severe: low strength, frost action.
DmB: Dempster	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight	Moderate: shrink-swell, slope.	Severe: low strength, frost action.
DtB:					
Dempster	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight	Moderate: shrink-swell, slope.	Severe: low strength, frost action.
Talmo	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight.
Dw: Dimo	Severe: cutbanks cave, wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: low strength, flooding, frost action.

Table 12.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
DxB: Dobalt	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
DyA:					
Dobalt	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.
Bonilla	Moderate: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, wetness.
EaB:					
Egan	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.
Ethan	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
EeB:					
Egan	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.
Ethan	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
Trent	Moderate: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action, wetness.
EfA:					
Egan	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.
Trent	Moderate: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action, wetness.
EgB:					
Egan	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.
Wentworth	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.
Trent	Moderate: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action, wetness.
EnA: Enet	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.

Table 12.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
EoA:					
Enet	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
Dimo	Severe: cutbanks cave, wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: low strength, flooding, frost action.
EpD:					
Ethan	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.
Betts	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.
EsE:					
Ethan	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.
Clarno	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.
EtD:					
Ethan	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.
Clarno	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.
EuC, ExC:					
Ethan	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
Egan	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.
FaA: Flandreau	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.
FaB: Flandreau	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
FtB:					
Flandreau	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
Thurman	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight.
GrA: Graceville	Severe: cutbanks cave.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.

Table 12.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
GsB: Grovena	Slight	Slight	Slight	Moderate: slope.	Severe: frost action.
GvA:					
Grovena	Slight	Slight	Slight	Slight	Severe: frost action.
Bonilla	Moderate: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, wetness.
HoB: Houdek	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
HsC:					
Houdek	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
Shindler	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
HsD:					
Houdek	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.
Shindler	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.
HtD:					
Houdek	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.
Talmo	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.
HuA, HuB: Huntimer	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
IhA: Ihlen	Severe: depth to rock.	Moderate: shrink-swell, depth to rock.	Severe: depth to rock.	Moderate: shrink-swell, depth to rock.	Severe: low strength, frost action.
IrB:					
Ihlen	Severe: depth to rock.	Moderate: shrink-swell, depth to rock.	Severe: depth to rock.	Moderate: shrink-swell, depth to rock.	Severe: low strength, frost action.
Rock outcrop	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
IrE:					
Ihlen	Severe: depth to rock.	Moderate: shrink-swell, slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Severe: low strength, frost action.

Table 12.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
IrE:					
Rock outcrop	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.
Ja: Janude	Moderate: wetness.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding, frost action.
La, Lb: Lamo	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, flooding, frost action.
M-W. Miscellaneous water					
MdB: Moody	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.
MgA:					
Moody	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.
Gayville	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Moderate: low strength, wetness, flooding.
MnB, MnC:					
Moody	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.
Nora	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.
MtA:					
Moody	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.
Trent	Moderate: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action, wetness.
NcC:					
Nora	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.
Crofton	Slight	Slight	Slight	Moderate: slope.	Severe: low strength.
Ob: Obert	Severe: ponding.	Severe: flooding, ponding, shrink-swell.	Severe: flooding, ponding, shrink-swell.	Severe: flooding, ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.

Table 12.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Og: Orthents	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Or: Orthents	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.
Ow:					
Orthents	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Aquents	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Pt: Pits, quarry	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.
Sa: Salmo	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.
SdE:					
Shindler	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.
Houdek	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.
SnE:					
Shindler	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.
Talmo	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
SpA: Splitrock	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.
SpB: Splitrock	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.
SsF:					
Steinauer	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.
Shindler	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.

Table 12.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
TdE:					
Talmo	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Delmont	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Te: Tetonka	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.
TfC:					
Thurman	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight.
Flandreau	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
TgD:					
Thurman	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.
Grovena	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: frost action.
Tr: Trent	Moderate: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action, wetness.
W. Water					
Wa:					
Wakonda	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.
Chancellor	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.
WcA:					
Wentworth	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.
Chancellor	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.
Wakonda	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.

Table 12.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
WhA:					
Wentworth	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.
Trent	Moderate: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action, wetness.
WhB:					
Wentworth	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.
Trent	Moderate: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action, wetness.
Wk: Whitewood	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.
Wo: Worthing	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.
Wr:					
Worthing	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.
Davison	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: frost action.

Table 13.--Sanitary Facilities

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. See text for definitions of terms used in this table. Absence of an entry indicates that no rating is applicable)

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
AcA: Alcester	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
AcB: Alcester	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Ar: Arlo	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy, small stones.
Ba, Bb: Baltic	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
BcA:					
Benclare	Severe: wetness, percs slowly.	Slight	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
Corson	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
BeE:					
Betts	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Ethan	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
BfA: Blendon	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: seepage.
BhB:					
Blendon	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: seepage.
Henkin	Moderate: percs slowly.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: thin layer.
Bo: Bon	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, wetness.	Fair: wetness.
Cb: Chancellor	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: hard to pack, wetness.

Table 13.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Cc:					
Chancellor	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: hard to pack, wetness.
Tetonka	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
Cd: Chaska	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: wetness, thin layer.
Ch: Chaska	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: thin layer.
Cm: Clamo	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
CoB: Corson	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
CoC: Corson	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
CpC:					
Corson	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
Henkin	Moderate: percs slowly.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Fair: thin layer.
CrD:					
Crofton	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
Nora	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
CrE:					
Crofton	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Nora	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
CsD:					
Crofton	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.

Table 13.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
CsD:					
Shindler	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
DcA: Davis	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
DcB: Davis	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
DcC: Davis	Moderate: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Dd:					
Davison	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Moderate: wetness.	Fair: too clayey, wetness.
Crossplain	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
DeA, DeB:					
Delmont	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Enet	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
DgC, DgD:					
Delmont	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Talmo	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
DmA, DmB: Dempster	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
DtB:					
Dempster	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Talmo	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.

Table 13.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Dw: Dimo	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy, small stones.
DxB: Dobalt	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Poor: hard to pack.
DyA:					
Dobalt	Severe: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight	Poor: hard to pack.
Bonilla	Severe: wetness, percs slowly.	Moderate: seepage, wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey.
EaB:					
Egan	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Poor: hard to pack.
Ethan	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
EeB:					
Egan	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Poor: hard to pack.
Ethan	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Trent	Severe: wetness.	Moderate: seepage.	Severe: wetness.	Severe: wetness.	Fair: too clayey.
EfA:					
Egan	Severe: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight	Poor: hard to pack.
Trent	Severe: wetness.	Moderate: seepage.	Severe: wetness.	Severe: wetness.	Fair: too clayey.
EgB:					
Egan	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Poor: hard to pack.
Wentworth	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Trent	Severe: wetness.	Moderate: seepage.	Severe: wetness.	Severe: wetness.	Fair: too clayey.
EnA: Enet	Severe: wetness, poor filter.	Severe: seepage.	Severe: seepage, wetness, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.

Table 13.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
EoA:					
Enet	Severe: wetness, poor filter.	Severe: seepage.	Severe: seepage, wetness, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Dimo	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy, small stones.
EpD:					
Ethan	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Betts	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
EsE:					
Ethan	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Clarno	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
EtD:					
Ethan	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Clarno	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
EuC:					
Ethan	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Egan	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight	Poor: hard to pack.
ExC:					
Ethan	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Egan	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Poor: hard to pack.
FaA, FaB: Flandreau	Severe: poor filter.	Severe: seepage.	Moderate: too clayey.	Severe: seepage.	Poor: thin layer.
FtB:					
Flandreau	Severe: poor filter.	Severe: seepage.	Moderate: too clayey.	Severe: seepage.	Poor: thin layer.
Thurman	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.

Table 13.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
GrA: Graceville	Moderate: wetness.	Severe: seepage.	Severe: seepage.	Moderate: wetness.	Fair: too clayey, thin layer.
GsB: Grovena	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
GvA:					
Grovena	Moderate: percs slowly.	Moderate: seepage.	Slight	Slight	Good.
Bonilla	Severe: wetness, percs slowly.	Moderate: seepage, wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey.
HoB: Houdek	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
HsC:					
Houdek	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Shindler	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
HsD:					
Houdek	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Shindler	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
HtD:					
Houdek	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Talmo	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
HuA: Huntimer	Severe: percs slowly.	Slight	Moderate: too clayey.	Slight	Poor: hard to pack.
HuB: Huntimer	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Poor: hard to pack.
IhA: Ihlen	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock.
IrB:					
Ihlen	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock.
Rock outcrop	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock.

Table 13.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
IrE:					
Ihlen	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock.
Rock outcrop	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock.
Ja Janude	Moderate: flooding, wetness, percs slowly.	Severe: seepage.	Severe: seepage, wetness.	Moderate: flooding, wetness.	Good.
La, Lb Lamo	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: hard to pack, wetness.
M-W. Miscellaneous water					
MdB Moody	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Poor: hard to pack.
MgA:					
Moody	Moderate: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight	Poor: hard to pack.
Gayville	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, excess sodium.	Severe: wetness.	Poor: excess sodium.
MnB:					
Moody	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Poor: hard to pack.
Nora	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
MnC:					
Moody	Moderate: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight	Poor: hard to pack.
Nora	Moderate: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
MtA:					
Moody	Moderate: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight	Poor: hard to pack.
Trent	Severe: wetness.	Moderate: seepage.	Severe: wetness.	Severe: wetness.	Fair: too clayey.
NcC:					
Nora	Moderate: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Crofton	Moderate: percs slowly.	Severe: slope.	Slight	Slight	Good.

Table 13.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Ob: Obert	Severe: flooding, ponding, percs slowly.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Poor: hard to pack, ponding.
Og: Orthents	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
Or: Orthents	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Ow:					
Orthents	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
Aquents	Severe: ponding, poor filter.	Severe: seepage, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: seepage, too sandy, small stones.
Pt: Pits, quarry	Severe: depth to rock, slope, seepage.	Severe: depth to rock, slope, seepage.	Severe: depth to rock, slope, seepage.	Severe: depth to rock, slope, seepage.	Poor: depth to rock, seepage, small stones.
Sa: Salmo	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
SdE:					
Shindler	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Houdek	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
SnE:					
Shindler	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Talmo	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
SpA: Splitrock	Severe: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight	Poor: hard to pack.
SpB: Splitrock	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Poor: hard to pack.
SsF:					
Steinauer	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: hard to pack, slope.

Table 13.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
SsF:					
Shindler	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
TdE:					
Talmo	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
Delmont	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
Te: Tetonka	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
TfC:					
Thurman	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Flandreau	Severe: poor filter.	Severe: seepage, slope.	Moderate: too clayey.	Severe: seepage.	Poor: thin layer.
TgD:					
Thurman	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Grovena	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
Tr: Trent	Severe: wetness.	Moderate: seepage.	Severe: wetness.	Severe: wetness.	Fair: too clayey.
W. Water					
Wa:					
Wakonda	Severe: wetness.	Severe: wetness.	Moderate: wetness, too clayey.	Moderate: wetness.	Fair: too clayey, wetness.
Chancellor	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: hard to pack, wetness.
WcA:					
Wentworth	Severe: wetness, percs slowly.	Severe: wetness.	Moderate: wetness, too clayey.	Slight	Fair: too clayey, wetness.

Table 13.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
WcA:					
Chancellor	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: hard to pack, wetness.
Wakonda	Severe: wetness.	Severe: wetness.	Moderate: wetness, too clayey.	Moderate: wetness.	Fair: too clayey, wetness.
WhA:					
Wentworth	Moderate: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
Trent	Severe: wetness.	Moderate: seepage.	Severe: wetness.	Severe: wetness.	Fair: too clayey.
WhB:					
Wentworth	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Trent	Severe: wetness.	Moderate: seepage.	Severe: wetness.	Severe: wetness.	Fair: too clayey.
Wk Whitewood	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: hard to pack, wetness.
Wo Worthing	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
Wr:					
Worthing	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
Davison	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Moderate: wetness.	Fair: too clayey, wetness.

Table 14.--Construction Materials

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. See text for definitions of terms used in this table. Absence of an entry indicates that no rating is applicable)

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
AcA, AcB: Alcester	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Ar: Arlo	Poor: wetness.	Probable	Probable	Poor: area reclaim, wetness.
Ba, Bb: Baltic	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
BcA:				
Benclare	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Corson	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
BeE:				
Betts	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Ethan	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
BfA: Blendon	Good	Probable	Improbable: too sandy.	Fair: small stones.
BhB:				
Blendon	Good	Probable	Improbable: too sandy.	Fair: small stones.
Henkin	Good	Probable	Improbable: too sandy.	Fair: small stones.
Bo: Bon	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Cb: Chancellor	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Cc:				
Chancellor	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Tetonka	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.

Table 14.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Cd: Chaska	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Ch: Chaska	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, thin layer.
Cm: Clamo	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
CoB, CoC: Corson	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
CpC:				
Corson	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Henkin	Good	Probable	Improbable: too sandy.	Fair: small stones.
CrD:				
Crofton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
Nora	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, slope.
CrE:				
Crofton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Nora	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
CsD:				
Crofton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
Shindler	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, large stones, slope.
DcA, DcB, DcC: Davis	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Dd:				
Davison	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Crossplain	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.

Table 14.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
DeA, DeB:				
Delmont	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
Enet	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
DgC, DgD:				
Delmont	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
Talmo	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
DmA, DmB Dempster	Good	Probable	Probable	Poor: area reclaim.
DtB:				
Dempster	Good	Probable	Probable	Poor: area reclaim.
Talmo	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
Dw Dimo	Fair: wetness.	Probable	Probable	Poor: small stones, area reclaim.
DxB Dobalt	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
DyA:				
Dobalt	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Bonilla	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
EaB:				
Egan	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Ethan	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
EeB:				
Egan	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Ethan	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.

Table 14.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
EeB:				
Trent	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
EfA:				
Egan	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Trent	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
EgB:				
Egan	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Wentworth	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Trent	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
EnA Enet	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
EoA:				
Enet	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
Dimo	Fair: wetness.	Probable	Probable	Poor: small stones, area reclaim.
EpD:				
Ethan	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
Betts	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
EsE:				
Ethan	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Clarno	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, large stones, slope.
EtD:				
Ethan	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.

Table 14.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
EtD:				
Clarno	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
EuC, ExC:				
Ethan	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Egan	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
FaA, FaB Flandreau	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
FtB:				
Flandreau	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
Thurman	Good	Probable	Improbable: too sandy.	Fair; too sandy, thin layer.
GrA Graceville	Good	Probable	Probable	Good.
GsB Grovena	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
GvA:				
Grovena	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
Bonilla	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
HoB Houdek	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, large stones.
HsC:				
Houdek	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, large stones.
Shindler	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, large stones.
HsD:				
Houdek	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, large stones, slope.
Shindler	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, large stones, slope.

Table 14.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
HtD:				
Houdek	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, large stones, slope.
Talmo	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
HuA, HuB Huntimer	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
IhA Ihlen	Poor: depth to rock, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: depth to rock, too clayey.
IrB:				
Ihlen	Poor: depth to rock, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: depth to rock, too clayey.
Rock outcrop	Poor: depth to rock.	Improbable: small stones.	Probable	Poor: depth to rock, area reclaim, small stones.
IrE:				
Ihlen	Poor: depth to rock, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: depth to rock, too clayey, slope.
Rock outcrop	Poor: depth to rock.	Improbable: small stones.	Probable	Poor: depth to rock, area reclaim, small stones.
Ja Janude	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
La, Lb Lamo	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
M-W. Miscellaneous water				
MdB Moody	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
MgA:				
Moody	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Gayville	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess salt, excess sodium.
MnB, MnC:				
Moody	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.

Table 14.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
MnB, MnC:				
Nora	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
MtA:				
Moody	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Trent	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
NcC:				
Nora	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Crofton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Ob Obert	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Og Orthents	Poor: slope.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
Or Orthents	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Ow:				
Orthents	Poor: slope.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
Aquents	Poor: wetness.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
Pt Pits, quarry	Poor: depth to rock, slope.	Improbable: small stones.	Probable	Poor: depth to rock, area reclaim, small stones.
Sa Salmo	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess salt, wetness.
SdE:				
Shindler	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Houdek	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
SnE:				
Shindler	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.

Table 14.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
SnE:				
Talmo	Poor: slope.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
SpA, SpB: Splitrock	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
SsF:				
Steinauer	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Shindler	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
TdE:				
Talmo	Poor: slope.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
Delmont	Fair: slope.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
Te: Tetonka	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
TfC:				
Thurman	Good	Probable	Improbable: too sandy.	Fair: too sandy, thin layer.
Flandreau	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
TgD:				
Thurman	Good	Probable	Improbable: too sandy.	Fair: too sandy, thin layer, slope.
Grovena	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
Tr: Trent	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
W. Water				
Wa:				
Wakonda	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Chancellor	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.

Table 14.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
WcA:				
Wentworth	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Chancellor	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Wakonda	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
WhA, WhB:				
Wentworth	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Trent	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Wk: Whitewood	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Wo: Worthing	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Wr:				
Worthing	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Davison	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.

Table 15.--Water Management

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. See text for definitions of terms used in this table. Absence of an entry indicates that no rating is applicable)

Soil name and map symbol	Limitations for-- Pond reservoir areas	Limitations for-- Embankments, dikes, and levees	Features affecting-- Drainage	Features affecting-- Irrigation	Features affecting-- Terraces and diversions	Features affecting-- Grassed waterways
AcA: Alcester	Moderate: seepage.	Moderate: piping, seepage.	Deep to water	Favorable	Erodes easily	Erodes easily.
AcB: Alcester	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
Ar: Arlo	Severe: seepage.	Severe: seepage, piping, wetness.	Flooding, frost action, cutbanks cave.	Wetness, rooting depth, flooding.	Wetness, too sandy.	Wetness, rooting depth.
Ba, Bb: Baltic	Slight	Severe: hard to pack, ponding.	Ponding, percs slowly, frost action.	Ponding, percs slowly.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
BcA:						
Benclare	Slight	Severe: hard to pack.	Deep to water	Percs slowly	Percs slowly	Percs slowly.
Corson	Slight	Severe: hard to pack.	Deep to water	Slow intake, percs slowly.	Percs slowly	Percs slowly.
BeE:						
Betts	Severe: slope.	Moderate: piping.	Deep to water	Slope, excess salt.	Slope, erodes easily.	Slope, erodes easily.
Ethan	Severe: slope.	Moderate: piping.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
BfA: Blendon	Severe: seepage.	Severe: seepage, piping.	Deep to water	Soil blowing	Too sandy, soil blowing.	Favorable.
BhB:						
Blendon	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, soil blowing.	Too sandy, soil blowing.	Favorable.
Henkin	Severe: seepage.	Severe: piping.	Deep to water	Slope, droughty.	Soil blowing	Droughty.
Bo: Bon	Severe: seepage.	Severe: piping.	Deep to water	Flooding	Favorable	Favorable.
Cb: Chancellor	Slight	Severe: hard to pack, wetness.	Percs slowly, flooding, frost action.	Wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
Cc:						
Chancellor	Slight	Severe: hard to pack, wetness.	Percs slowly, flooding, frost action.	Wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
Tetonka	Slight	Severe: hard to pack, ponding.	Ponding, percs slowly, frost action.	Ponding, percs slowly, erodes easily.	Erodes easily, ponding percs slowly.	Wetness, erodes easily, percs slowly.

Table 15.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
Cd Chaska	Severe: seepage.	Severe: piping, wetness.	Flooding, frost action, cutbanks cave.	Wetness, flooding.	Wetness	Wetness.
Ch Chaska	Severe: seepage.	Severe: piping, wetness.	Flooding, frost action, cutbanks cave.	Wetness, flooding.	Wetness	Favorable.
Cm Clamo	Slight	Severe: hard to pack, wetness.	Percs slowly, flooding, frost action.	Wetness, slow intake, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
CoB, CoC Corson	Moderate: slope.	Severe: hard to pack.	Deep to water	Slope, slow intake, percs slowly.	Percs slowly	Percs slowly.
CpC:						
Corson	Moderate: seepage, slope.	Severe: hard to pack.	Deep to water	Slope, slow intake, percs slowly.	Percs slowly	Percs slowly.
Henkin	Severe: seepage.	Severe: piping.	Deep to water	Slope, droughty.	Soil blowing	Droughty.
CrD, CrE:						
Crofton	Severe: slope.	Moderate: piping.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
Nora	Severe: slope.	Severe: piping.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
CsD:						
Crofton	Severe: slope.	Moderate: piping.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
Shindler	Severe: slope.	Slight	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
DcA Davis	Moderate: seepage.	Severe: piping.	Deep to water	Favorable	Favorable	Favorable.
DcB, DcC Davis	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope	Favorable	Favorable.
Dd:						
Davison	Moderate: seepage.	Severe: piping.	Frost action	Wetness, excess salt.	Erodes easily, wetness.	Erodes easily.
Crossplain	Slight	Severe: wetness.	Percs slowly, flooding, frost action.	Wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
DeA:						
Delmont	Severe: seepage.	Severe: seepage.	Deep to water	Droughty, rooting depth.	Too sandy	Droughty, rooting depth.
Enet	Severe: seepage.	Severe: seepage.	Deep to water	Favorable	Too sandy	Favorable.

Table 15.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
DeB:						
Delmont	Severe: seepage.	Severe: seepage.	Deep to water	Slope, droughty, rooting depth.	Too sandy	Droughty, rooting depth.
Enet	Severe: seepage.	Severe: seepage.	Deep to water	Slope	Too sandy	Favorable.
DgC:						
Delmont	Severe: seepage.	Severe: seepage.	Deep to water	Slope, droughty, rooting depth.	Too sandy	Droughty, rooting depth.
Talmo	Severe: seepage.	Severe: seepage.	Deep to water	Slope, droughty.	Too sandy	Droughty.
DgD:						
Delmont	Severe: seepage, slope.	Severe: seepage.	Deep to water	Slope, droughty, rooting depth.	Slope, too sandy.	Slope, droughty, rooting depth.
Talmo	Severe: seepage, slope.	Severe: seepage.	Deep to water	Slope, droughty.	Slope, too sandy.	Slope, droughty.
DmA Dempster	Severe: seepage.	Severe: seepage.	Deep to water	Favorable	Too sandy	Favorable.
DmB Dempster	Severe: seepage.	Severe: seepage.	Deep to water	Slope	Too sandy	Favorable.
DtB:						
Dempster	Severe: seepage.	Severe: seepage.	Deep to water	Slope	Too sandy	Favorable.
Talmo	Severe: seepage.	Severe: seepage.	Deep to water	Slope, droughty.	Too sandy	Droughty.
Dw Dimo	Severe: seepage.	Severe: seepage, wetness.	Flooding, frost action, cutbanks cave.	Wetness, rooting depth, flooding.	Wetness, too sandy.	Rooting depth.
DxB Dobalt	Moderate: seepage, slope.	Severe: hard to pack.	Deep to water	Slope	Favorable	Favorable.
DyA:						
Dobalt	Moderate: seepage.	Severe: hard to pack.	Deep to water	Favorable	Favorable	Favorable.
Bonilla	Moderate: seepage.	Moderate: piping.	Deep to water	Wetness	Favorable	Favorable.
EaB:						
Egan	Moderate: seepage, slope.	Severe: hard to pack.	Deep to water	Slope	Erodes easily	Erodes easily.
Ethan	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope	Erodes easily	Erodes easily.

Table 15.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
EeB:						
Egan	Moderate: seepage, slope.	Severe: hard to pack.	Deep to water	Slope	Erodes easily	Erodes easily.
Ethan	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
Trent	Moderate: seepage.	Moderate: piping.	Deep to water	Wetness	Erodes easily	Erodes easily.
EfA:						
Egan	Moderate: seepage.	Severe: hard to pack.	Deep to water	Favorable	Erodes easily	Erodes easily.
Trent	Moderate: seepage.	Moderate: piping.	Deep to water	Wetness	Erodes easily	Erodes easily.
EgB:						
Egan	Moderate: seepage, slope.	Severe: hard to pack.	Deep to water	Slope	Erodes easily	Erodes easily.
Wentworth	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
Trent	Moderate: seepage.	Moderate: piping.	Deep to water	Wetness	Erodes easily	Erodes easily.
EnA Enet	Severe: seepage.	Severe: seepage.	Deep to water	Favorable	Too sandy	Favorable.
EoA:						
Enet	Severe: seepage.	Severe: seepage.	Deep to water	Favorable	Too sandy	Favorable.
Dimo	Severe: seepage.	Severe: seepage, wetness.	Flooding, frost action, cutbanks cave.	Wetness, rooting depth, flooding.	Wetness, too sandy.	Rooting depth.
EpD:						
Ethan	Severe: slope.	Moderate: piping.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Betts	Severe: slope.	Moderate: piping.	Deep to water	Slope, excess salt.	Slope, erodes easily.	Slope, erodes easily.
EsE, EtD:						
Ethan	Severe: slope.	Moderate: piping.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Clarno	Severe: slope.	Moderate: piping.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
EuC, ExC:						
Ethan	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
Egan	Moderate: seepage, slope.	Severe: hard to pack.	Deep to water	Slope	Erodes easily	Erodes easily.

Table 15.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
FaA: Flandreau	Severe: seepage.	Severe: piping.	Deep to water	Favorable	Favorable	Favorable.
FaB: Flandreau	Severe: seepage.	Severe: piping.	Deep to water	Slope	Favorable	Favorable.
FtB:						
Flandreau	Severe: seepage.	Severe: piping.	Deep to water	Slope	Favorable	Favorable.
Thurman	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, droughty.	Too sandy, soil blowing.	Droughty.
GrA: Graceville	Severe: seepage.	Moderate: thin layer, piping.	Deep to water	Favorable	Favorable	Favorable.
GsB: Grovena	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
GvA:						
Grovena	Moderate: seepage.	Severe: piping.	Deep to water	Favorable	Erodes easily	Erodes easily.
Bonilla	Moderate: seepage.	Moderate: piping.	Deep to water	Wetness	Favorable	Favorable.
HoB: Houdek	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope	Favorable	Favorable.
HsC:						
Houdek	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope	Favorable	Favorable.
Shindler	Moderate: slope.	Slight	Deep to water	Slope	Erodes easily	Erodes easily.
HsD:						
Houdek	Severe: slope.	Moderate: piping.	Deep to water	Slope	Slope	Slope.
Shindler	Severe: slope.	Slight	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
HtD:						
Houdek	Severe: slope.	Moderate: piping.	Deep to water	Slope	Slope	Slope.
Talmo	Severe: seepage, slope.	Severe: seepage.	Deep to water	Slope, droughty.	Slope, too sandy.	Slope, droughty.
HuA: Huntimer	Slight	Moderate: hard to pack.	Deep to water	Percs slowly	Erodes easily, percs slowly.	Erodes easily, percs slowly.
HuB: Huntimer	Moderate: slope.	Moderate: hard to pack.	Deep to water	Slope, percs slowly.	Erodes easily, percs slowly.	Erodes easily. percs slowly.

Table 15.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
IhA: Ihlen	Moderate: seepage, depth to rock.	Severe: thin layer.	Deep to water	Depth to rock	Depth to rock, erodes easily.	Erodes easily, depth to rock.
IrB:						
Ihlen	Moderate: seepage, depth to rock, slope.	Severe: thin layer.	Deep to water	Slope, depth to rock.	Depth to rock, erodes easily.	Erodes easily, depth to rock.
Rock outcrop.						
IrE:						
Ihlen	Severe: slope.	Severe: thin layer.	Deep to water	Slope, depth to rock.	Slope, depth to rock, erodes easily.	Slope, erodes easily. depth to rock.
Rock outcrop.						
Ja: Janude	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing	Soil blowing	Favorable.
La, Lb: Lamo	Slight	Severe: wetness.	Flooding, frost action.	Wetness, flooding.	Erodes easily, wetness.	Wetness, erodes easily.
M-W. Miscellaneous water						
MdB: Moody	Moderate: seepage, slope.	Severe: thin layer.	Deep to water	Slope	Erodes easily	Erodes easily.
MgA:						
Moody	Moderate: seepage.	Severe: thin layer.	Deep to water	Favorable	Erodes easily	Erodes easily.
Gayville	Moderate: seepage.	Severe: piping, excess sodium.	Percs slowly, excess salt.	Wetness, percs slowly, erodes easily.	Erodes easily, wetness.	Excess sodium, erodes easily, percs slowly.
MnB, MnC:						
Moody	Moderate: seepage, slope.	Severe: thin layer.	Deep to water	Slope	Erodes easily	Erodes easily.
Nora	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
MtA:						
Moody	Moderate: seepage.	Severe: thin layer.	Deep to water	Favorable	Erodes easily	Erodes easily.
Trent	Moderate: seepage.	Moderate: piping.	Deep to water	Wetness	Erodes easily	Erodes easily.
NcC:						
Nora	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
Crofton	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.

Table 15.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
Ob: Obert	Moderate: seepage.	Severe: ponding.	Ponding, flooding, frost action.	Ponding, flooding.	Ponding	Wetness.
Og: Orthents	Severe: seepage, slope.	Severe: seepage.	Deep to water	Slope, droughty.	Slope, too sandy.	Slope, droughty, rooting depth.
Or: Orthents	Moderate: slope.	Severe: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
Ow:						
Orthents	Severe: seepage, slope.	Severe: seepage.	Deep to water	Slope, droughty.	Slope, too sandy.	Slope, droughty, rooting depth.
Aquents	Severe: seepage.	Severe: seepage, ponding.	Ponding, cutbanks cave.	Ponding, droughty.	Ponding, too sandy.	Wetness, droughty, rooting depth.
Pt: Pits, quarry	Severe: depth to rock, slope, seepage.	Severe: seepage.	Deep to water	Slope, droughty, depth to rock.	Slope, depth to rock.	Slope, droughty, depth to rock.
Sa: Salmo	Moderate: seepage.	Severe: wetness.	Flooding, frost action, excess salt.	Wetness, percs slowly, flooding.	Wetness	Wetness, excess salt.
SdE:						
Shindler	Severe: slope.	Slight	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Houdek	Severe: slope.	Moderate: piping.	Deep to water	Slope	Slope	Slope.
SnE:						
Shindler	Severe: slope.	Slight	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Talmo	Severe: seepage, slope.	Severe: seepage.	Deep to water	Slope, droughty.	Slope, too sandy.	Slope, droughty.
SpA: Splitrock	Moderate: seepage.	Severe: hard to pack.	Deep to water	Percs slowly	Erodes easily	Erodes easily, percs slowly.
SpB: Splitrock	Moderate: seepage, slope.	Severe: hard to pack.	Deep to water	Slope, percs slowly.	Erodes easily	Erodes easily, percs slowly.
SsF:						
Steinauer	Severe: slope.	Moderate: piping, hard to pack.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Shindler	Severe: slope.	Slight	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
TdE:						
Talmo	Severe: seepage, slope.	Severe: seepage.	Deep to water	Slope, droughty.	Slope, too sandy.	Slope, droughty.

Table 15.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
TdE:						
Delmont	Severe: seepage, slope.	Severe: seepage.	Deep to water	Slope, droughty, rooting depth.	Slope, too sandy.	Slope, droughty, rooting depth.
Te Tetonka	Slight	Severe: hard to pack, ponding.	Ponding, percs slowly, frost action.	Ponding, percs slowly, erodes easily.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
TfC:						
Thurman	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, droughty.	Too sandy, soil blowing.	Droughty.
Flandreau	Severe: seepage.	Severe: piping.	Deep to water	Slope	Favorable	Favorable.
TgD:						
Thurman	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Slope, droughty.	Slope, too sandy, soil blowing.	Slope, droughty.
Grovena	Severe: slope.	Severe: piping.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Tr Trent	Moderate: seepage.	Moderate: piping.	Deep to water	Wetness	Erodes easily	Erodes easily.
W. Water						
Wa:						
Wakonda	Moderate: seepage.	Moderate: piping, wetness.	Frost action	Wetness, excess salt.	Erodes easily, wetness.	Erodes easily.
Chancellor	Slight	Severe: hard to pack, wetness.	Percs slowly, flooding, frost action.	Wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
WcA:						
Wentworth	Moderate: seepage.	Severe: piping.	Deep to water	Favorable	Erodes easily	Erodes easily.
Chancellor	Slight	Severe: hard to pack, wetness.	Percs slowly, flooding, frost action.	Wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
Wakonda	Moderate: seepage.	Moderate: piping, wetness.	Frost action	Wetness, excess salt.	Erodes easily, wetness.	Erodes easily.
WhA:						
Wentworth	Moderate: seepage.	Severe: piping.	Deep to water	Favorable	Erodes easily	Erodes easily.
Trent	Moderate: seepage.	Moderate: piping.	Deep to water	Wetness	Erodes easily	Erodes easily.

Table 15.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
WhB:						
Wentworth	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
Trent	Moderate: seepage.	Moderate: piping.	Deep to water	Wetness	Erodes easily	Erodes easily.
Wk Whitewood	Slight	Severe: wetness.	Flooding, frost action.	Wetness, flooding.	Erodes easily, wetness.	Wetness, erodes easily.
Wo Worthing	Slight	Severe: hard to pack, ponding.	Ponding, percs slowly, frost action.	Ponding, percs slowly.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
Wr:						
Worthing	Slight	Severe: hard to pack, ponding.	Ponding, percs slowly, frost action.	Ponding, percs slowly.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
Davison	Moderate: seepage.	Severe: piping.	Frost action	Wetness, excess salt.	Erodes easily, wetness.	Erodes easily.

Table 16.--Engineering Index Properties

(NP means nonplastic. Absence of an entry indicates that data were not estimated)

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
AcA-------------- Alcester	0-8	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	90-100	35-50	10-25
	8-50	Silty clay loam, silt loam.	CL, ML	A-6, A-7	0	100	100	95-100	90-100	35-50	10-25
	50-80	Silty clay loam, silt loam, loam.	ML, CL	A-6, A-7	0	95-100	95-100	85-100	75-100	30-50	10-20
AcB-------------- Alcester	0-8	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	90-100	35-50	10-25
	8-50	Silty clay loam, silt loam.	CL, ML	A-6, A-7	0	100	100	95-100	90-100	35-50	10-25
	50-80	Silty clay loam, silt loam.	ML, CL	A-6, A-7	0	100	95-100	95-100	85-100	35-50	10-25
Ar--------------- Arlo	0-10	Loam-------------	ML, CL	A-6, A-7	0	100	95-100	85-100	60-85	35-50	10-25
	10-30	Loam, sandy clay loam, clay loam.	ML, CL, SC, SM	A-4, A-6, A-7	0	95-100	90-100	60-95	40-75	30-45	5-20
	30-80	Stratified loamy sand to very gravelly sand.	GM, SM, GP-GM, SP-SM	A-2, A-1, A-3	0-5	60-100	40-95	35-65	5-35	15-35	NP-10
Ba--------------- Baltic	0-7	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	85-100	35-50	15-25
	7-55	Silty clay, clay, silty clay loam.	CH, MH	A-7	0	100	95-100	90-100	85-100	50-70	20-40
	55-80	Silty clay, silty clay loam, clay loam.	CL, CH, MH, ML	A-6, A-7	0	100	95-100	80-100	65-95	35-70	15-35
Bb--------------- Baltic	0-7	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	85-100	35-50	15-25
	7-38	Silty clay, clay, silty clay loam.	CH, MH	A-7	0	100	95-100	90-100	85-100	50-70	20-40
	38-80	Silty clay, silty clay loam, clay loam.	CL, CH, MH, ML	A-6, A-7	0	100	95-100	80-100	65-95	35-70	15-35
BcA:											
Benclare--------	0-8	Silty clay loam	CH, CL	A-7	0	100	100	95-100	85-100	45-60	20-35
	8-31	Silty clay loam, silty clay.	CH, CL, ML, MH	A-7	0	100	100	95-100	85-100	45-65	15-35
	31-42	Silty clay loam, silty clay.	CH, CL, ML, MH	A-7	0	100	100	95-100	85-100	45-65	15-35
	42-80	Silty clay loam, silty clay, clay.	CH, CL	A-7	0	100	100	90-100	80-100	40-60	20-35
Corson----------	0-6	Silty clay-------	CH, MH	A-7	0	100	100	95-100	90-100	50-75	20-41
	6-16	Silty clay, clay	CH, MH	A-7	0	100	100	95-100	90-100	50-80	20-45
	16-49	Silty clay, clay	CH, MH	A-7	0	100	100	95-100	90-100	50-80	20-45
	49-80	Silty clay, clay	CH, MH	A-7	0	100	100	95-100	90-100	50-80	20-45
BeE:											
Betts-----------	0-5	Loam-------------	CL	A-6	0-5	90-100	80-100	75-100	60-75	30-40	10-20
	5-26	Loam, clay loam	CL	A-6, A-7	0-5	90-100	85-100	75-100	50-85	30-45	10-25
	26-80	Clay loam, loam	CL	A-6, A-7	0-5	90-100	85-100	75-100	50-85	30-45	10-25
Ethan-----------	0-9	Loam-------------	CL, CL-ML	A-4, A-6	0-5	95-100	90-100	85-100	55-85	25-40	5-20
	9-39	Loam, clay loam	CL	A-6, A-7	0-5	95-100	90-100	80-100	55-80	30-50	10-25
	39-80	Loam, clay loam	CL	A-4, A-6, A-7	0-5	90-100	85-100	75-100	50-95	28-45	8-20

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
BfA-------------- Blendon	0-12	Fine sandy loam	SM	A-4	0	100	90-100	60-100	35-50	20-30	NP-5
	12-28	Fine sandy loam, sandy loam, loam.	SM, SC, ML, CL	A-4, A-2	0	100	85-100	60-100	20-60	20-33	NP-10
	28-80	Fine sand, loamy fine sand, loamy sand.	SP-SM, SM, SC-SM, SC	A-2, A-4	0	85-100	75-100	50-100	10-45	15-30	NP-10
BhB:											
Blendon---------	0-12	Fine sandy loam	SM	A-4	0	100	90-100	60-100	35-50	20-30	NP-5
	12-28	Fine sandy loam, sandy loam, loam.	SM, SC, ML, CL	A-4, A-2	0	100	85-100	60-100	20-60	20-33	NP-10
	28-80	Fine sand, loamy fine sand, loamy sand.	SP-SM, SM, SC-SM, SC	A-2, A-4	0	85-100	75-100	50-100	10-45	15-30	NP-10
Henkin----------	0-9	Fine sandy loam	SM, SC, ML, CL	A-4	0-5	90-100	80-100	65-100	35-55	15-30	NP-10
	9-25	Loam, sandy loam, fine sandy loam.	SM, SC, ML, CL	A-4	0-5	90-100	80-100	65-100	35-60	15-30	NP-10
	25-46	Sandy loam, fine sandy loam, loam.	SM, SC, ML, CL	A-4, A-2	0-5	90-100	80-100	65-90	30-60	15-30	NP-10
	46-80	Stratified fine sand to clay loam.	SM, SC, SP-SM, SC-SM	A-2, A-4, A-1, A-3	0-5	90-100	80-100	35-95	5-50	15-35	NP-10
Bo--------------- Bon	0-39	Loam-------------	CL-ML, CL	A-4, A-6	0	100	95-100	80-95	55-85	25-40	5-15
	39-80	Stratified silty clay loam to loamy fine sand.	ML, SM, SC, CL	A-4, A-6, A-7	0	95-100	95-100	75-95	45-95	25-45	3-22
Cb--------------- Chancellor	0-12	Silty clay loam	CL, CH, MH, ML	A-6, A-7	0	100	100	95-100	85-100	35-55	15-25
	12-31	Silty clay, silty clay loam.	CL, CH	A-7	0	100	100	95-100	85-100	40-60	15-30
	31-80	Silty clay loam, clay loam, loam.	CL, CH, ML, MH	A-6, A-7	0	100	100	85-100	70-100	35-55	15-25
Cc:											
Chancellor------	0-12	Silty clay loam	CL, CH, MH, ML	A-6, A-7	0	100	100	95-100	85-100	35-55	15-25
	12-31	Silty clay, silty clay loam.	CL, CH	A-7	0	100	100	95-100	85-100	40-60	15-30
	31-80	Silty clay loam, clay loam, loam.	CL, CH, ML, MH	A-6, A-7	0	100	100	85-100	70-100	35-55	15-25
Tetonka---------	0-16	Silt loam--------	ML, CL	A-4, A-6, A-7	0	100	100	95-100	80-100	27-50	8-20
	16-20	Silty clay loam, silt loam.	CL	A-6, A-7	0	95-100	95-100	90-100	80-100	30-50	10-25
	20-45	Clay, silty clay, clay loam.	CL, CH, MH, ML	A-7	0	95-100	95-100	85-100	65-100	40-70	15-35
	45-80	Clay loam, silty clay, clay.	CL, CH	A-6, A-7	0	95-100	95-100	80-100	55-95	30-60	11-30

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
Cd---------------Chaska	0-6	Loam-------------	CL, ML	A-4, A-6	0	100	100	85-100	60-75	25-40	5-15
	6-17	Stratified silt loam to loamy fine sand.	CL, CL-ML	A-4, A-6	0	100	100	85-95	60-75	20-40	5-15
	17-80	Stratified silty clay loam to fine sand.	SM, ML	A-4	0	100	100	85-95	35-75	15-35	NP-7
Ch---------------Chaska	0-6	Loam-------------	CL, CL-ML	A-4, A-6	0	100	100	85-95	60-75	30-36	11-15
	6-17	Stratified silt loam to loamy fine sand.	CL, CL-ML	A-4, A-6	0	100	100	85-95	60-75	20-40	5-15
	17-80	Stratified silty clay loam to fine sand.	SM, ML	A-4	0	100	100	85-95	35-75	15-35	NP-7
Cm---------------Clamo	0-8	Silty clay-------	CH, MH	A-7	0	100	95-100	95-100	85-100	50-75	25-40
	8-25	Silty clay loam, silty clay, clay.	CL, CH, MH, ML	A-7	0	100	95-100	90-100	85-100	45-75	20-40
	25-60	Silty clay loam, silty clay.	CL, CH, MH, ML	A-7	0	100	95-100	90-100	85-100	45-75	20-40
	60-80	Silty clay loam, silty clay.	CL, CH, MH, ML	A-7	0	100	95-100	90-100	85-100	45-75	20-40
CoB, CoC---------Corson	0-6	Silty clay-------	CH, MH	A-7	0	100	100	95-100	90-100	50-75	20-41
	6-16	Silty clay, clay	CH, MH	A-7	0	100	100	95-100	90-100	50-80	20-45
	16-49	Silty clay, clay	CH, MH	A-7	0	100	100	95-100	90-100	50-80	20-45
	49-80	Silty clay, clay	CH, MH	A-7	0	100	100	95-100	90-100	50-80	20-45
CpC:											
Corson----------	0-8	Silty clay-------	CH, MH	A-7	0	100	100	95-100	90-100	50-75	20-41
	8-14	Silty clay, clay	CH, MH	A-7	0	100	100	95-100	90-100	50-80	20-45
	14-51	Silty clay, clay	CH, MH	A-7	0	100	100	95-100	90-100	50-80	20-45
	51-80	Silty clay, clay, silty clay loam.	CH, CL	A-6, A-7	0	100	100	95-100	95-100	35-80	12-45
Henkin----------	0-9	Fine sandy loam	SM, SC, ML, CL	A-4	0-5	90-100	80-100	65-100	35-55	15-30	NP-10
	9-25	Loam, sandy loam, fine sandy loam.	SM, SC, ML, CL	A-4	0-5	90-100	80-100	65-100	35-60	15-30	NP-10
	25-46	Sandy loam, fine sandy loam, loam.	SM, SC, ML, CL	A-4, A-2	0-5	90-100	80-100	65-90	30-60	15-30	NP-10
	46-80	Stratified fine sand to clay loam.	SM, SC, SP-SM, SC-SM	A-2, A-4, A-1, A-3	0-5	90-100	80-100	35-95	5-50	15-35	NP-10
CrD, CrE:											
Crofton---------	0-6	Silt loam--------	ML, CL	A-6, A-7	0	100	100	95-100	95-100	35-50	10-25
	6-80	Silt loam--------	CL	A-6, A-7	0	100	95-100	95-100	95-100	30-50	5-25
Nora------------	0-9	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	95-100	35-50	12-25
	9-22	Silt loam, silty clay loam.	CL, ML	A-6, A-7	0	95-100	95-100	95-100	85-100	35-50	11-20
	22-80	Silt loam, silty clay loam.	CL, CL-ML, ML	A-4, A-6, A-7	0	95-100	95-100	95-100	85-100	27-50	6-20
CsD:											
Crofton---------	0-6	Silt loam--------	ML, CL	A-6, A-7	0	100	100	95-100	95-100	35-50	10-25
	6-80	Silt loam--------	CL	A-6, A-7	0	100	95-100	95-100	95-100	35-50	5-25

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
CsD:											
Shindler	0-8	Clay loam	CL, ML	A-6, A-7	0-5	95-100	95-100	85-100	65-80	35-45	10-20
	8-14	Clay loam, loam	CL	A-6, A-7	0-5	95-100	95-100	85-100	65-80	35-50	15-30
	14-80	Clay loam, loam	CL	A-6, A-7	0-5	95-100	95-100	85-100	65-80	35-50	15-30
DcA: Davis	0-8	Loam	CL, ML	A-4, A-6, A-7	0	100	90-100	80-100	60-85	30-45	5-20
	8-47	Loam, silt loam, clay loam.	CL, ML	A-4, A-6, A-7	0	100	90-100	80-100	60-85	30-45	5-20
	47-80	Loam, clay loam, silt loam.	CL, ML	A-4, A-6, A-7	0	100	95-100	85-100	55-90	30-45	5-20
DcB, DcC: Davis	0-8	Loam	CL, ML	A-6, A-7, A-4	0	100	90-100	80-100	60-85	30-45	5-20
	8-47	Loam, silt loam, clay loam.	CL, ML	A-6, A-7	0	100	90-100	80-100	60-85	35-45	10-20
	47-80	Loam, clay loam, silt loam.	CL	A-6, A-7	0	100	95-100	85-100	55-90	30-45	10-20
Dd:											
Davison	0-8	Clay loam	CL	A-6, A-7	0	100	95-100	90-100	70-80	30-45	10-20
	8-41	Loam, clay loam, sandy loam.	CL, CL-ML, SC, SC-SM	A-4, A-6	0-5	95-100	95-100	85-100	45-80	25-40	5-20
	41-80	Loam, clay loam	CL-ML, CL	A-4, A-6	0-5	95-100	95-100	85-100	60-80	25-40	5-20
Crossplain	0-8	Clay loam	CL, ML	A-6, A-7	0	100	100	90-100	70-80	35-45	10-20
	8-24	Clay loam, clay	CL, CH	A-7	0	100	95-100	90-100	70-90	40-55	15-30
	24-42	Clay loam, loam	CL	A-6, A-7	0	95-100	95-100	85-100	60-80	30-45	10-25
	42-80	Clay loam, loam	CL	A-6, A-7	0-5	95-100	95-100	85-100	60-80	30-45	10-25
DeA, DeB:											
Delmont	0-8	Loam	CL	A-6, A-4	0	90-100	90-100	80-95	60-75	28-40	8-20
	8-15	Loam, fine sandy loam, sandy loam.	SC, CL, CL-ML, SC-SM	A-4, A-6	0	80-100	70-100	50-100	35-70	20-40	5-18
	15-80	Sand, gravelly loamy sand, gravelly sand.	SM, SW-SM, SC-SM, SW	A-1, A-2	0-5	60-100	40-80	15-50	3-30	15-25	NP-5
Enet	0-7	Loam	ML, CL	A-4, A-6	0	100	100	85-95	55-80	30-40	5-15
	7-23	Loam, clay loam, sandy clay loam.	CL, ML, SC, SM	A-4, A-6	0	90-100	85-100	70-95	45-75	30-40	5-15
	23-28	Loam, fine sandy loam, sandy loam.	ML, CL, SM, SC	A-4, A-6	0	90-100	85-95	60-95	40-75	20-40	3-15
	28-80	Gravelly loamy sand, gravelly sand, very gravelly sand.	SW, SW-SM, SM, SC-SM	A-1, A-2, A-3	0	60-95	45-90	10-60	0-15	15-25	NP-5
DgC, DgD:											
Delmont	0-8	Loam	CL	A-6, A-4	0	90-100	90-100	80-95	60-75	28-40	8-20
	8-15	Loam, fine sandy loam, sandy loam.	SC, CL, CL-ML, SC-SM	A-4, A-6	0	80-100	70-100	50-100	35-70	20-40	5-18
	15-80	Sand, gravelly loamy sand, gravelly sand.	SM, SW-SM, SC-SM, SW	A-1, A-2	0-5	60-100	40-80	15-50	3-30	15-25	NP-5

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
DgC, DgD:											
Talmo-----------	0-7	Gravelly loam----	CL, SC	A-4, A-6	0-5	90-100	65-90	35-90	25-80	28-34	9-14
	7-80	Extremely gravelly sand, very gravelly sand, very gravelly loamy sand.	GW, GM, SW, SM	A-2, A-1	0-10	40-95	20-65	15-35	0-35	15-25	NP-5
DmA, DmB--------- Dempster	0-9	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	25-40	6-15
	9-37	Silty clay loam, silt loam.	CL, ML	A-6, A-7, A-4	0	100	100	90-100	75-95	30-45	7-20
	37-80	Gravelly sand, gravelly loamy sand, very gravelly loamy sand.	SM, SW, SW-SM, GP-GM	A-2, A-1, A-3	0-5	55-90	30-75	20-60	3-30	15-25	NP-5
DtB:											
Dempster--------	0-9	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	25-40	6-15
	9-37	Silty clay loam, silt loam.	CL, ML	A-6, A-7, A-4	0	100	100	90-100	75-95	30-45	7-20
	37-80	Gravelly sand, gravelly loamy sand, very gravelly loamy sand.	SM, SW, SW-SM, GP-GM	A-2, A-1, A-3	0-5	55-90	30-75	20-60	3-30	15-25	NP-5
Talmo-----------	0-7	Gravelly loam----	CL, SC	A-4, A-6	0-5	90-100	65-90	35-90	25-80	28-34	9-14
	7-80	Extremely gravelly sand, very gravelly sand, very gravelly loamy sand.	GW, GM, SW, SM	A-2, A-1	0-10	40-95	20-65	15-35	0-35	15-25	NP-5
Dw--------------- Dimo	0-7	Clay loam--------	CL	A-6, A-7	0	100	100	85-95	70-85	35-45	12-20
	7-39	Clay loam, loam, sandy clay loam.	CL	A-6, A-7	0	90-100	85-100	85-95	50-80	35-45	12-20
	39-80	Gravelly sand, gravelly loamy sand, very gravelly sand.	SM, SP-SM, SW-SM, SC-SM	A-1, A-2, A-3	0-5	60-90	40-70	20-60	5-30	15-25	NP-5
DxB-------------- Dobalt	0-8	Loam-------------	ML, CL	A-4, A-6	0	100	100	90-100	70-90	30-40	7-15
	8-19	Loam, sandy clay loam, silt loam.	ML, CL	A-4, A-6	0	100	100	90-100	70-90	25-40	3-15
	19-29	Loam, sandy clay loam, silt loam.	ML, CL	A-4, A-6	0	100	100	90-100	70-90	25-40	3-15
	29-80	Loam, clay loam	CL, ML, CH, MH	A-6, A-7	0-10	90-100	85-95	80-90	55-80	30-55	10-25
DyA:											
Dobalt----------	0-8	Loam-------------	ML, CL	A-4, A-6	0	100	100	90-100	70-90	30-40	7-15
	8-19	Loam, sandy clay loam, silt loam.	ML, CL	A-4, A-6	0	100	100	90-100	70-90	25-40	3-15
	19-29	Loam, sandy clay loam, silt loam.	ML, CL	A-4, A-6	0	100	100	90-100	70-90	25-40	3-15
	29-80	Loam, clay loam	CL, ML, CH, MH	A-6, A-7	0-10	90-100	85-95	80-90	55-80	30-55	10-25

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
DyA:											
Bonilla	0-11	Loam	CL-ML, CL	A-4, A-6	0	100	95-100	75-100	50-80	25-40	5-20
	11-32	Loam, clay loam	CL	A-6, A-7	0	100	95-100	85-100	60-90	30-50	10-25
	32-45	Loam, clay loam, silt loam.	CL	A-6, A-7	0-5	95-100	95-100	85-100	40-90	30-45	10-22
	45-80	Loam, clay loam, silt loam.	CL	A-6, A-7	0-5	95-100	95-100	85-100	60-90	30-45	10-22
EaB:											
Egan	0-10	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
	10-28	Silty clay loam, silt loam.	CL, CH, ML, MH	A-6, A-7	0	100	95-100	90-100	80-100	35-55	10-30
	28-43	Clay loam, loam	CL, CH, ML, MH	A-6, A-7	0-5	95-100	80-100	70-100	60-85	30-55	10-25
	43-80	Clay loam, loam	CL, CH, ML, MH	A-6, A-7	0-5	95-100	80-100	70-100	60-85	30-55	10-25
Ethan	0-9	Loam	CL, CL-ML	A-4, A-6	0-5	95-100	90-100	85-100	55-85	25-40	5-20
	9-39	Loam, clay loam	CL	A-6, A-7	0-5	95-100	90-100	80-100	55-80	30-50	10-25
	39-80	Loam, clay loam	CL	A-4, A-6, A-7	0-5	90-100	85-100	75-100	50-95	28-45	8-20
EeB:											
Egan	0-10	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
	10-28	Silty clay loam, silt loam.	CL, CH, ML, MH	A-6, A-7	0	100	95-100	90-100	80-100	35-55	10-30
	28-43	Clay loam, loam	CL, CH, ML, MH	A-6, A-7	0-5	95-100	80-100	70-100	60-85	30-55	10-25
	43-80	Clay loam, loam	CL, CH, ML, MH	A-6, A-7	0-5	95-100	80-100	70-100	60-85	30-55	10-25
Ethan	0-9	Loam	CL, CL-ML	A-4, A-6	0-5	95-100	90-100	85-100	55-85	25-40	5-20
	9-39	Loam, clay loam	CL	A-6, A-7	0-5	95-100	90-100	80-100	55-80	30-50	10-25
	39-80	Loam, clay loam	CL	A-4, A-6, A-7	0-5	90-100	85-100	75-100	50-95	28-45	8-20
Trent	0-15	Silty clay loam	CL, CH, ML, MH	A-6, A-7	0	100	100	95-100	90-100	35-55	10-30
	15-39	Silty clay loam	CL, CH	A-6, A-7	0	100	95-100	90-100	80-100	35-55	15-30
	39-46	Silt loam, silty clay loam.	CL	A-6, A-7, A-4	0	100	95-100	90-100	80-100	30-50	8-25
	46-52	Silt loam, silty clay loam.	CL, ML	A-6, A-7, A-4	0	100	90-100	85-100	70-100	30-50	8-20
	52-80	Silt loam, silty clay loam.	CL	A-6, A-7, A-4	0	100	90-100	85-100	70-100	30-45	8-20
EfA:											
Egan	0-10	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
	10-28	Silty clay loam, silt loam.	CL, CH, ML, MH	A-6, A-7	0	100	95-100	90-100	80-100	35-55	10-30
	28-43	Clay loam, loam	CL, CH, ML, MH	A-6, A-7	0-5	95-100	80-100	70-100	60-85	30-55	10-25
	43-80	Clay loam, loam	CL, CH, ML, MH	A-6, A-7	0-5	95-100	80-100	70-100	60-85	30-55	10-25
Trent	0-15	Silty clay loam	CL, CH, ML, MH	A-6, A-7	0	100	100	95-100	90-100	35-55	10-30
	15-39	Silty clay loam	CL, CH	A-6, A-7	0	100	95-100	90-100	80-100	35-55	15-30
	39-46	Silt loam, silty clay loam.	CL	A-6, A-7, A-4	0	100	95-100	90-100	80-100	30-50	8-25
	46-52	Silt loam, silty clay loam.	CL, ML	A-6, A-7, A-4	0	100	90-100	85-100	70-100	30-50	8-20
	52-80	Silt loam, silty clay loam.	CL	A-6, A-7, A-4	0	100	90-100	85-100	70-100	30-45	8-20

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag-ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct					Pct	
EgB:											
Egan	0-10	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
	10-28	Silty clay loam, silt loam.	CL, CH, ML, MH	A-6, A-7	0	100	95-100	90-100	80-100	35-55	10-30
	28-43	Clay loam, loam	CL, CH, ML, MH	A-6, A-7	0-5	95-100	80-100	70-100	60-85	30-55	10-25
	43-80	Clay loam, loam	CL, CH, ML, MH	A-6, A-7	0-5	95-100	80-100	70-100	60-85	30-55	10-25
Wentworth	0-10	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-100	35-50	11-25
	10-26	Silty clay loam, silt loam.	CL, CH, MH, ML	A-6, A-7	0	100	100	95-100	80-100	35-55	10-30
	26-55	Silty clay loam, silt loam.	CL, ML	A-4, A-6, A-7	0	100	95-100	85-100	60-100	30-50	5-25
	55-80	Clay loam, loam	CL	A-6, A-7	0-5	95-100	90-100	85-100	55-85	30-50	10-25
Trent	0-15	Silty clay loam	CL, CH, ML, MH	A-6, A-7	0	100	100	95-100	90-100	35-55	10-30
	15-39	Silty clay loam	CL, CH	A-6, A-7	0	100	95-100	90-100	80-100	35-55	15-30
	39-46	Silt loam, silty clay loam.	CL	A-6, A-7, A-4	0	100	95-100	90-100	80-100	30-50	8-25
	46-52	Silt loam, silty clay loam.	CL, ML	A-6, A-7, A-4	0	100	90-100	85-100	70-100	30-50	8-20
	52-80	Silt loam, silty clay loam.	CL	A-6, A-7, A-4	0	100	90-100	85-100	70-100	30-45	8-20
EnA											
Enet	0-7	Loam	ML, CL	A-4, A-6	0	100	100	85-95	55-80	30-40	5-15
	7-23	Loam, clay loam, sandy clay loam.	CL, ML, SC, SM	A-4, A-6	0	90-100	85-100	70-95	45-75	30-40	5-15
	23-28	Loam, fine sandy loam, sandy loam.	ML, CL, SM, SC	A-4, A-6	0	90-100	85-95	60-95	40-75	20-40	3-15
	28-80	Gravelly loamy sand, gravelly sand, very gravelly sand.	SW, SW-SM, SM, SC-SM	A-1, A-2, A-3	0	60-95	45-90	10-60	0-15	15-25	NP-5
EoA:											
Enet	0-7	Loam	ML, CL	A-4, A-6	0	100	100	85-95	55-80	30-40	5-15
	7-23	Loam, clay loam, sandy clay loam.	CL, ML, SC, SM	A-4, A-6	0	90-100	85-100	70-95	45-75	30-40	5-15
	23-28	Loam, fine sandy loam, sandy loam.	ML, CL, SM, SC	A-4, A-6	0	90-100	85-95	60-95	40-75	20-40	3-15
	28-80	Gravelly loamy sand, gravelly sand, very gravelly sand.	SW, SW-SM, SM, SC-SM	A-1, A-2, A-3	0	60-95	45-90	10-60	0-15	15-25	NP-5
Dimo	0-7	Clay loam	CL	A-6, A-7	0	100	100	85-95	70-85	35-45	12-20
	7-39	Clay loam, loam, sandy clay loam.	CL	A-6, A-7	0	90-100	85-100	85-95	50-80	35-45	12-20
	39-80	Gravelly sand, gravelly loamy sand, very gravelly sand.	SM, SP-SM, SW-SM, SC-SM	A-1, A-2, A-3	0-5	60-90	40-70	20-60	5-30	15-25	NP-5
EpD:											
Ethan	0-9	Loam	CL, CL-ML	A-4, A-6	0-5	95-100	90-100	85-100	55-85	25-40	5-20
	9-39	Loam, clay loam	CL	A-6, A-7	0-5	95-100	90-100	80-100	55-80	30-50	10-25
	39-80	Loam, clay loam	CL	A-4, A-6, A-7	0-5	90-100	85-100	75-100	50-95	28-45	8-20

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
EpD:											
Betts-----------	0-5	Loam-------------	CL	A-6	0-5	90-100	80-100	75-100	60-75	30-40	10-20
	5-26	Loam, clay loam	CL	A-6, A-7	0-5	90-100	85-100	75-100	50-85	30-45	10-25
	26-80	Clay loam, loam	CL	A-6, A-7	0-5	90-100	85-100	75-100	50-85	30-45	10-25
EsE:											
Ethan-----------	0-9	Loam-------------	CL, CL-ML	A-4, A-6	20-50	95-100	90-100	80-95	55-80	25-40	5-15
	9-39	Loam, clay loam	CL	A-6, A-7, A-4	0-5	95-100	95-100	85-100	55-80	30-45	8-20
	39-80	Loam, clay loam	CL	A-6, A-7, A-4	0-5	90-100	85-100	75-100	50-85	30-50	8-25
Clarno----------	0-10	Loam-------------	CL, CL-ML	A-4, A-6	20-50	95-100	90-100	80-95	55-85	25-40	5-15
	10-22	Loam, clay loam	CL	A-6, A-7	0-5	95-100	90-100	80-100	55-85	30-45	10-20
	22-44	Loam, clay loam	CL	A-6, A-7	0-5	95-100	90-100	80-100	55-85	30-45	10-20
	44-80	Loam, clay loam	CL	A-6, A-7	0-5	95-100	90-100	80-100	55-85	30-45	10-20
EtD:											
Ethan-----------	0-9	Loam-------------	CL, CL-ML	A-4, A-6	0-5	95-100	90-100	85-100	55-85	25-40	5-20
	9-39	Loam, clay loam	CL	A-6, A-7	0-5	95-100	90-100	80-100	55-80	30-50	10-25
	39-80	Loam, clay loam	CL	A-4, A-6, A-7	0-5	90-100	85-100	75-100	50-95	28-45	8-20
Clarno----------	0-10	Loam-------------	CL, CL-ML	A-4, A-6	0-5	95-100	95-100	85-100	55-85	25-40	5-20
	10-22	Loam, clay loam	CL	A-6, A-7	0-5	95-100	90-100	80-100	55-85	30-45	10-20
	22-44	Loam, clay loam	CL	A-6, A-7	0-5	95-100	90-100	80-100	55-85	30-45	10-20
	44-80	Loam, clay loam	CL	A-6, A-7	0-5	95-100	90-100	80-100	55-85	30-45	10-20
EuC:											
Ethan-----------	0-9	Loam-------------	CL, CL-ML	A-4, A-6	0-5	95-100	90-100	85-100	55-85	25-40	5-20
	9-39	Loam, clay loam	CL	A-6, A-7	0-5	95-100	90-100	80-100	55-80	30-50	10-25
	39-80	Loam, clay loam	CL	A-4, A-6, A-7	0-5	90-100	85-100	75-100	50-95	28-45	8-20
Egan------------	0-10	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
	10-28	Silty clay loam, silt loam.	CL, CH, ML, MH	A-6, A-7	0	100	95-100	90-100	80-100	35-55	10-30
	28-43	Clay loam, loam	CL, CH, ML, MH	A-6, A-7	0-5	95-100	80-100	70-100	60-85	30-55	10-25
	43-80	Clay loam, loam	CL, CH, ML, MH	A-6, A-7	0-5	95-100	80-100	70-100	60-85	30-55	10-25
ExC:											
Ethan-----------	0-9	Loam-------------	CL, CL-ML	A-4, A-6	20-50	95-100	90-100	80-95	55-80	25-40	5-15
	9-39	Loam, clay loam	CL	A-6, A-7, A-4	0-5	95-100	95-100	85-100	55-80	30-45	8-20
	39-80	Loam, clay loam	CL	A-6, A-7, A-4	0-5	90-100	85-100	75-100	50-85	30-50	8-25
Egan------------	0-10	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
	10-28	Silty clay loam, silt loam.	CL, CH, ML, MH	A-6, A-7	0	100	95-100	90-100	80-100	35-55	10-30
	28-43	Clay loam, loam	CL, CH, ML, MH	A-6, A-7	0-5	95-100	80-100	70-100	60-85	30-55	10-25
	43-80	Clay loam, loam	CL, CH, ML, MH	A-6, A-7	0-5	95-100	80-100	70-100	60-85	30-55	10-25

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
FaA, FaB--------- Flandreau	0-7	Loam-------------	CL, CL-ML	A-4, A-6	0	100	100	85-100	65-95	25-40	5-20
	7-33	Silt loam, loam, clay loam.	CL, ML	A-4, A-6, A-7	0	100	95-100	85-100	65-95	30-45	5-20
	33-39	Sandy loam, fine sandy loam.	SM, SC, SC-SM	A-4	0	100	95-100	60-70	35-45	15-30	NP-10
	39-78	Loamy sand, loamy fine sand, fine sandy loam.	SM, SC-SM, SW-SM	A-2	0	100	100	50-75	10-30	15-25	NP-5
	78-80	Loam, clay loam	CL-ML, CL	A-6, A-4	0-5	95-100	95-100	85-100	65-95	25-40	5-20
FtB: Flandreau-------	0-7	Loam-------------	CL, CL-ML	A-4, A-6	0	100	100	85-100	65-95	25-40	5-20
	7-33	Silt loam, loam, clay loam.	CL, ML	A-4, A-6, A-7	0	100	95-100	85-100	65-95	30-45	5-20
	33-39	Sandy loam, fine sandy loam.	SM, SC, SC-SM	A-4	0	100	95-100	60-70	35-45	15-30	NP-10
	39-78	Loamy sand, loamy fine sand, fine sandy loam.	SM, SC-SM, SW-SM	A-2	0	100	100	50-75	10-30	15-25	NP-5
	78-80	Loam, clay loam	CL-ML, CL	A-6, A-4	0-5	95-100	95-100	85-100	65-95	25-40	5-20
Thurman---------	0-10	Fine sandy loam	SM	A-4	0	100	100	70-100	35-50	15-20	NP-5
	10-31	Loamy fine sand, loamy sand, fine sandy loam.	SM, SP-SM	A-2, A-3, A-4	0	100	100	90-100	5-40	15-20	NP-5
	31-80	Fine sand, sand, loamy fine sand.	SP-SM, SM	A-3, A-2	0	100	100	50-95	5-35	15-20	NP-5
GrA-------------- Graceville	0-18	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-95	35-45	11-20
	18-52	Silty clay loam, silt loam.	CL	A-4, A-6, A-7	0	100	100	90-100	70-90	30-45	8-20
	52-80	Gravelly sand, gravelly loamy sand, very gravelly sand.	SM, GW-GM, SW-SM, GM	A-1, A-2	0	40-80	30-70	20-50	5-30	15-25	NP-5
GsB-------------- Grovena	0-9	Loam-------------	ML, CL	A-4, A-6	0	100	95-100	90-100	60-85	30-40	7-15
	9-13	Loam, silt loam, silty clay loam.	ML, CL	A-4, A-6, A-7	0	100	95-100	90-100	60-85	30-45	8-17
	13-30	Loam, silt loam, sandy loam.	ML, CL-ML, SC-SM	A-4, A-6	0	100	95-100	85-100	45-75	20-40	3-15
	30-36	Silt loam, loam, sandy loam.	ML, CL, SC, SM	A-4, A-6	0	95-100	95-100	90-100	45-80	30-40	5-15
	36-80	Stratified sandy loam to clay loam.	CL, CL-ML	A-4, A-6	0	95-100	95-100	85-100	50-80	25-40	5-20
GvA: Grovena---------	0-9	Loam-------------	ML, CL	A-4, A-6	0	100	95-100	90-100	60-85	30-40	7-15
	9-13	Loam, silt loam, silty clay loam.	ML, CL	A-4, A-6, A-7	0	100	95-100	90-100	60-85	30-45	8-17
	13-30	Loam, silt loam, sandy loam.	ML, CL-ML, SC-SM	A-4, A-6	0	100	95-100	85-100	45-75	20-40	3-15
	30-36	Silt loam, loam, sandy loam.	ML, CL, SC, SM	A-4, A-6	0	95-100	95-100	90-100	45-80	30-40	5-15
	36-80	Stratified sandy loam to clay loam.	CL, CL-ML	A-4, A-6	0	95-100	95-100	85-100	50-80	25-40	5-20

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
GvA:											
Bonilla	0-11	Loam	CL-ML, CL	A-4, A-6	0	100	95-100	75-100	50-80	25-40	5-20
	11-32	Loam, clay loam	CL	A-6, A-7	0	100	95-100	85-100	60-90	30-50	10-25
	32-45	Loam, clay loam, silt loam.	CL	A-6, A-7	0-5	95-100	95-100	85-100	60-90	30-45	10-22
	45-80	Loam, clay loam, silt loam.	CL	A-6, A-7	0-5	95-100	95-100	85-100	60-90	30-45	10-22
HoB	0-6	Clay loam	CL	A-6, A-7	0-5	95-100	95-100	85-100	60-80	30-45	10-20
Houdek	6-17	Clay loam	CL, ML	A-6, A-7	0-5	95-100	95-100	85-100	60-80	35-50	10-25
	17-33	Clay loam, loam	CL, ML	A-6, A-7	0-10	95-100	95-100	85-100	60-80	35-50	10-25
	33-80	Clay loam, loam	CL	A-6, A-7	0-5	90-100	90-100	80-100	55-80	30-50	10-25
HsC, HsD:											
Houdek	0-6	Clay loam	CL	A-6, A-7	0-5	95-100	95-100	85-100	60-80	30-45	10-20
	6-17	Clay loam	CL, ML	A-6, A-7	0-5	95-100	95-100	85-100	60-80	35-50	10-25
	17-33	Clay loam, loam	CL, ML	A-6, A-7	0-10	95-100	95-100	85-100	60-80	35-50	10-25
	33-80	Clay loam, loam	CL	A-6, A-7	0-5	90-100	90-100	80-100	55-80	30-50	10-25
Shindler	0-8	Clay loam	CL, ML	A-6, A-7	0-5	95-100	95-100	85-100	65-80	35-45	10-20
	8-14	Clay loam, loam	CL	A-6, A-7	0-5	95-100	95-100	85-100	65-80	35-50	15-30
	14-80	Clay loam, loam	CL	A-6, A-7	0-5	95-100	95-100	85-100	65-80	35-50	15-30
HtD:											
Houdek	0-6	Clay loam	CL	A-6, A-7	0-5	95-100	95-100	85-100	60-80	30-45	10-20
	6-17	Clay loam	CL, ML	A-6, A-7	0-5	95-100	95-100	85-100	60-80	35-50	10-25
	17-33	Clay loam, loam	CL, ML	A-6, A-7	0-10	95-100	95-100	85-100	60-80	35-50	10-25
	33-80	Clay loam, loam	CL	A-6, A-7	0-5	90-100	90-100	80-100	55-80	30-50	10-25
Talmo	0-7	Gravelly loam	CL, SC	A-4, A-6	0-5	90-100	65-90	35-90	25-80	28-34	9-14
	7-80	Extremely gravelly sand, very gravelly sand, very gravelly loamy sand.	GW, GM, SW, SM	A-2, A-1	0-10	40-95	20-65	15-35	0-35	15-25	NP-5
HuA, HuB	0-7	Silty clay loam	CL, CH, MH, ML	A-7	0	100	100	95-100	90-100	45-60	15-30
Huntimer											
	7-18	Silty clay loam, silty clay.	CL, CH, MH, ML	A-7	0	100	100	95-100	90-100	45-70	20-35
	18-38	Silty clay loam, silty clay.	CL, CH, MH, ML	A-7	0	100	100	95-100	90-100	40-65	15-30
	38-80	Stratified very fine sandy loam to silty clay loam.	CL, CH	A-6, A-7	0	100	95-100	95-100	85-100	35-60	15-30
IhA	0-11	Silty clay loam	CL, ML	A-7, A-6	0	100	100	95-100	85-95	34-50	10-25
Ihlen	11-25	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	90-100	35-50	15-25
	25-35	Silt loam	ML, CL	A-4, A-6	0	100	100	90-100	85-100	30-40	8-15
	35	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
IrB, IrE:											
Ihlen	0-11	Silty clay loam	CL, ML	A-7, A-6	0	100	100	95-100	85-95	34-50	10-25
	11-25	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	90-100	35-50	15-25
	25-35	Silt loam	ML, CL	A-4, A-6	0	100	100	90-100	85-100	30-40	8-15
	35	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
Ja--------------- Janude	0-19	Fine sandy loam	SM	A-4	0	100	100	75-90	36-50	15-25	NP-8
	19-43	Loam, fine sandy loam.	ML	A-4	0	100	100	85-95	60-75	20-34	NP-7
	43-80	Fine sandy loam, loam, silty clay loam.	SM, ML, CL, SC	A-4, A-6	0	100	100	70-100	40-100	20-45	3-20
La, Lb----------- Lamo	0-7	Silty clay loam	CL, CH	A-7, A-6, A-4	0	100	100	95-100	80-95	25-55	8-25
	7-80	Silty clay loam, silt loam.	CL, CH	A-7, A-6	0	100	100	95-100	85-95	30-55	11-25
M-W. Miscellaneous water											
MdB-------------- Moody	0-11	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	90-100	35-50	13-25
	11-35	Silty clay loam, silt loam.	CL, CH	A-6, A-7	0	100	100	95-100	85-100	32-55	11-33
	35-50	Silt loam, silty clay loam.	CL, ML, CL-ML	A-4, A-6, A-7	0	100	100	95-100	85-100	20-45	3-20
	50-80	Silt loam--------	CL, ML, CL-ML	A-4, A-6, A-7	0	100	100	95-100	85-100	20-45	3-20
MgA: Moody-----------	0-11	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	90-100	35-50	13-25
	11-35	Silty clay loam, silt loam.	CL, CH	A-6, A-7	0	100	100	95-100	85-100	32-55	11-33
	35-50	Silt loam, silty clay loam.	CL, ML, CL-ML	A-4, A-6, A-7	0	100	100	95-100	85-100	20-45	3-20
	50-80	Silt loam--------	CL, ML, CL-ML	A-4, A-6, A-7	0	100	100	95-100	85-100	20-45	3-20
Gayville--------	0-2	Silt loam--------	ML, CL	A-4, A-6	0	100	100	95-100	85-100	25-40	3-15
	2-13	Silty clay loam, silty clay.	CL	A-6, A-7	0	100	100	95-100	85-100	35-50	22-30
	13-26	Silty clay loam	CL	A-4, A-6, A-7	0	100	100	95-100	85-100	30-45	8-20
	26-80	Loamy very fine sand, loam, clay loam.	ML, CL-ML	A-4, A-6	0	100	100	85-100	70-95	15-40	NP-20
MnB, MnC: Moody-----------	0-11	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	90-100	35-50	13-25
	11-35	Silty clay loam, silt loam.	CL, CH	A-6, A-7	0	100	100	95-100	85-100	32-55	11-33
	35-50	Silt loam, silty clay loam.	CL, ML, CL-ML	A-4, A-6, A-7	0	100	100	95-100	85-100	20-45	3-20
	50-80	Silt loam--------	CL, ML, CL-ML	A-4, A-6, A-7	0	100	100	95-100	85-100	20-45	3-20
Nora------------	0-9	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	95-100	35-50	12-25
	9-22	Silt loam, silty clay loam.	CL, ML	A-6, A-7	0	95-100	95-100	95-100	85-100	35-50	11-20
	22-80	Silt loam, silty clay loam.	CL, CL-ML, ML	A-4, A-6, A-7	0	95-100	95-100	95-100	85-100	27-50	6-20

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
MtA:											
Moody-----------	0-11	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	90-100	35-50	13-25
	11-35	Silty clay loam, silt loam.	CL, CH	A-6, A-7	0	100	100	95-100	85-100	32-55	11-33
	35-50	Silt loam, silty clay loam.	CL, ML, CL-ML	A-4, A-6, A-7	0	100	100	95-100	85-100	20-45	3-20
	50-80	Silt loam--------	CL, ML, CL-ML	A-4, A-6, A-7	0	100	100	95-100	85-100	20-45	3-20
Trent-----------	0-15	Silty clay loam	CL, CH, ML, MH	A-6, A-7	0	100	100	95-100	90-100	35-55	10-30
	15-39	Silty clay loam	CL, CH	A-6, A-7	0	100	95-100	90-100	80-100	35-55	15-30
	39-46	Silt loam, silty clay loam.	CL	A-6, A-7, A-4	0	100	95-100	90-100	80-100	30-50	8-25
	46-52	Silt loam, silty clay loam.	CL, ML	A-6, A-7, A-4	0	100	90-100	85-100	70-100	30-50	8-20
	52-80	Silt loam, silty clay loam.	CL	A-6, A-7, A-4	0	100	90-100	85-100	70-100	30-45	8-20
NcC:											
Nora------------	0-9	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	95-100	35-50	12-25
	9-22	Silt loam, silty clay loam.	CL, ML	A-6, A-7	0	95-100	95-100	95-100	85-100	35-50	11-20
	22-80	Silt loam, silty clay loam.	CL, CL-ML, ML	A-4, A-6, A-7	0	95-100	95-100	95-100	85-100	27-50	6-20
Crofton---------	0-6	Silt loam--------	ML, CL	A-6, A-7	0	100	100	95-100	95-100	35-50	10-25
	6-80	Silt loam--------	CL	A-6, A-7	0	100	95-100	95-100	95-100	30-50	5-25
Ob--------------- Obert	0-13	Silty clay loam	CL, CH	A-6, A-7	0	100	100	95-100	90-100	35-55	15-35
	13-52	Silty clay loam, silt loam.	CL, CH	A-4, A-6, A-7	0	100	100	95-100	85-100	20-55	7-35
	52-80	Silty clay loam, silt loam, loam.	CL, CL-ML	A-4, A-6	0	100	100	80-100	75-95	25-45	7-25
Og--------------- Orthents	0-18	Gravelly sandy loam.	SM, GM	A-4, A-2	0-5	60-90	50-80	45-70	25-50	20-35	NP-7
	18-80	Gravelly loamy sand, gravelly sand, very gravelly sand.	SW, SW-SM, SM	A-1	0-10	60-85	45-70	15-45	0-15	15-25	NP-5
Or--------------- Orthents	0-6	Clay loam--------	CL	A-6, A-7	0-5	95-100	90-100	80-95	75-95	30-45	10-25
	6-80	Loam, silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0-5	90-100	85-100	75-100	55-90	25-40	5-20
Ow:											
Orthents--------	0-18	Gravelly sandy loam.	SM, GM	A-4, A-2	0-5	60-90	50-80	45-70	25-50	20-35	NP-7
	18-80	Gravelly loamy sand, gravelly sand, very gravelly sand.	SW, SW-SM, SM	A-1	0-10	60-85	45-70	15-45	0-15	15-25	NP-5
Aquents---------	0-8	Gravelly loam----	SM, GM	A-4, A-2	0-5	60-90	50-80	45-70	25-50	20-35	NP-7
	8-80	Gravelly loamy sand, gravelly sand, very gravelly sand.	SW, SW-SM, SM	A-1	0-10	60-85	45-70	15-45	0-15	15-25	NP-5
Pt--------------- Pits, quarry	0-80	Unweathered bedrock.	GP, GP-GM	A-1-a	0-5	0-5	0-5	0-5	0-5	---	NP

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
Sa---------------	0-17	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-95	30-50	10-25
Salmo	17-49	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	85-95	30-45	10-20
	49-80	Silty clay loam, clay loam, sandy loam.	CL, SM	A-6, A-4	0	95-100	95-100	85-100	50-80	20-40	5-15
SdE:											
Shindler--------	0-8	Clay loam--------	CL, ML	A-6, A-7	0-5	95-100	95-100	85-100	65-80	35-45	10-20
	8-14	Clay loam, loam	CL	A-6, A-7	0-5	95-100	95-100	85-100	65-80	35-50	15-30
	14-80	Clay loam, loam	CL	A-6, A-7	0-5	95-100	95-100	85-100	65-80	35-50	15-30
Houdek----------	0-6	Clay loam--------	CL	A-6, A-7	0-5	95-100	95-100	85-100	60-80	30-45	10-20
	6-17	Clay loam--------	CL, ML	A-6, A-7	0-5	95-100	95-100	85-100	60-80	35-50	10-25
	17-33	Clay loam, loam	CL, ML	A-6, A-7	0-10	95-100	95-100	85-100	60-80	35-50	10-25
	33-80	Clay loam, loam	CL	A-6, A-7	0-5	90-100	90-100	80-100	55-80	30-50	10-25
SnE:											
Shindler--------	0-8	Clay loam--------	CL, ML	A-6, A-7	0-5	95-100	95-100	85-100	65-80	35-45	10-20
	8-14	Clay loam, loam	CL	A-6, A-7	0-5	95-100	95-100	85-100	65-80	35-50	15-30
	14-80	Clay loam, loam	CL	A-6, A-7	0-5	95-100	95-100	85-100	65-80	35-50	15-30
Talmo-----------	0-7	Gravelly loam----	CL, SC	A-4, A-6	0-5	90-100	65-90	35-90	25-80	28-34	9-14
	7-80	Extremely gravelly sand, very gravelly sand, very gravelly loamy sand.	GW, GM, SW, SM	A-2, A-1	0-10	40-95	20-65	15-35	0-35	15-25	NP-5
SpA, SpB---------	0-9	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
Splitrock	9-34	Silty clay loam, silt loam.	CL, CH, ML, MH	A-6, A-7	0	100	95-100	90-100	80-100	35-55	10-30
	34-51	Clay loam, loam	CL, CH, ML, MH	A-6, A-7	0-5	95-100	80-100	70-100	60-85	30-55	10-25
	51-80	Clay loam, loam	CL, CH, ML, MH	A-6, A-7	0-5	95-100	80-100	70-100	60-85	30-55	10-25
SsF:											
Steinauer-------	0-4	Clay loam--------	CL	A-6, A-7	0-5	95-100	95-100	85-100	55-90	30-50	15-25
	4-13	Clay loam--------	CL, CH	A-6, A-7	0-5	95-100	95-100	90-100	70-90	30-55	12-30
	13-80	Loam, clay loam	CL, CH	A-6, A-7	0-5	95-100	95-100	90-100	60-75	25-55	10-30
Shindler--------	0-8	Clay loam--------	CL, ML	A-6, A-7	0-5	95-100	95-100	85-100	65-80	35-45	10-20
	8-14	Clay loam, loam	CL	A-6, A-7	0-5	95-100	95-100	85-100	65-80	35-50	15-30
	14-80	Clay loam, loam	CL	A-6, A-7	0-5	95-100	95-100	85-100	65-80	35-50	15-30
TdE:											
Talmo-----------	0-7	Gravelly loam----	CL, SC	A-4, A-6	0-5	90-100	65-90	35-90	25-80	28-34	9-14
	7-80	Extremely gravelly sand, very gravelly sand, very gravelly loamy sand.	GW, GM, SW, SM	A-2, A-1	0-10	40-95	20-65	15-35	0-35	15-25	NP-5

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
TdE:											
Delmont	0-8	Loam	CL	A-6, A-4	0	90-100	90-100	80-95	60-75	28-40	8-20
	8-15	Loam, fine sandy loam, sandy loam.	SC, CL, CL-ML, SC-SM	A-4, A-6	0	80-100	70-100	50-100	35-70	20-40	5-18
	15-80	Very gravelly sand, very gravelly loamy sand, gravelly sand.	SM, SW-SM, SC-SM, SW	A-1, A-2	0-5	60-100	40-80	15-50	3-30	15-25	NP-5
Te: Tetonka	0-16	Silt loam	ML, CL	A-4, A-6, A-7	0	100	100	95-100	80-100	27-50	8-20
	16-20	Silty clay loam, silt loam.	CL	A-6, A-7	0	95-100	95-100	90-100	80-100	30-50	10-25
	20-45	Clay, silty clay, clay loam.	CL, CH, MH, ML	A-7	0	95-100	95-100	85-100	65-100	40-70	15-35
	45-80	Clay loam, silty clay, clay.	CL, CH	A-6, A-7	0	95-100	95-100	80-100	55-95	30-60	11-30
TfC:											
Thurman	0-10	Fine sandy loam	SM	A-4	0	100	100	70-100	35-50	15-20	NP-5
	10-31	Loamy fine sand, loamy sand, fine sandy loam.	SM, SP-SM	A-2, A-3, A-4	0	100	100	90-100	5-40	15-20	NP-5
	31-80	Fine sand, sand, loamy fine sand.	SP-SM, SM	A-3, A-2	0	100	100	50-95	5-35	15-20	NP-5
Flandreau	0-7	Loam	CL, CL-ML	A-4, A-6	0	100	100	85-100	65-95	25-40	5-20
	7-33	Silt loam, loam, clay loam.	CL, ML	A-4, A-6, A-7	0	100	95-100	85-100	65-95	30-45	5-20
	33-39	Sandy loam, fine sandy loam.	SM, SC, SC-SM	A-4	0	100	95-100	60-70	35-45	15-30	NP-10
	39-78	Loamy sand, loamy fine sand, fine sandy loam.	SM, SC-SM, SW-SM	A-2	0	100	100	50-75	10-30	15-25	NP-5
	78-80	Loam, clay loam	CL-ML, CL	A-6, A-4	0-5	95-100	95-100	85-100	65-95	25-40	5-20
TgD:											
Thurman	0-10	Fine sandy loam	SM	A-4	0	100	100	70-100	35-50	15-20	NP-5
	10-31	Loamy fine sand, loamy sand, fine sandy loam.	SM, SP-SM	A-2, A-3, A-4	0	100	100	90-100	5-40	15-20	NP-5
	31-80	Fine sand, sand, loamy fine sand.	SP-SM, SM	A-3, A-2	0	100	100	50-95	5-35	15-20	NP-5
Grovena	0-9	Loam	ML, CL	A-4, A-6	0	100	95-100	90-100	60-85	30-40	7-15
	9-13	Loam, silt loam, silty clay loam.	ML, CL	A-4, A-6, A-7	0	100	95-100	90-100	60-85	30-45	8-17
	13-30	Loam, silt loam, sandy loam.	ML, CL-ML, SC-SM	A-4, A-6	0	100	95-100	85-100	45-75	20-40	3-15
	30-36	Silt loam, loam, sandy loam.	ML, CL, SC, SM	A-4, A-6	0	95-100	95-100	90-100	45-80	30-40	5-15
	36-80	Stratified sandy loam to silt loam.	CL, CL-ML	A-4, A-6	0	95-100	95-100	85-100	50-80	25-40	5-15

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
Tr: Trent	0-15	Silty clay loam	CL, CH, ML, MH	A-6, A-7	0	100	100	95-100	90-100	35-55	10-30
	15-39	Silty clay loam	CL, CH	A-6, A-7	0	100	95-100	90-100	80-100	35-55	15-30
	39-46	Silt loam, silty clay loam.	CL	A-6, A-7, A-4	0	100	95-100	90-100	80-100	30-50	8-25
	46-52	Silt loam, silty clay loam.	CL, ML	A-6, A-7, A-4	0	100	90-100	85-100	70-100	30-50	8-20
	52-80	Silt loam, silty clay loam.	CL	A-6, A-7, A-4	0	100	90-100	85-100	70-100	30-45	8-20
W. Water											
Wa: Wakonda	0-13	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	85-100	30-50	10-25
	13-38	Silt loam, silty clay loam.	CL	A-6, A-7	0	95-100	95-100	90-100	85-100	30-50	10-25
	38-73	Silt loam, silty clay loam, loam.	CL	A-6, A-7	0	95-100	95-100	85-95	60-90	30-50	10-25
	73-80	Clay loam, loam	CL	A-6, A-7	0-5	95-100	90-100	85-100	55-85	30-50	10-25
Chancellor	0-12	Silty clay loam	CL, CH, MH, ML	A-6, A-7	0	100	100	95-100	85-100	35-55	15-25
	12-31	Silty clay, silty clay loam.	CL, CH	A-7	0	100	100	95-100	85-100	40-60	15-30
	31-80	Silty clay loam, clay loam, loam.	CL, CH, ML, MH	A-6, A-7	0	100	100	85-100	70-100	35-55	15-25
WcA: Wentworth	0-10	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-100	35-50	11-25
	10-26	Silty clay loam, silt loam.	CL, CH, MH, ML	A-6, A-7	0	100	100	95-100	80-100	35-55	10-30
	26-55	Stratified silty clay loam to silt loam.	CL, ML	A-4, A-6, A-7	0	100	95-100	85-100	60-100	30-50	5-25
	55-80	Clay loam, loam	CL	A-6, A-7	0-5	95-100	90-100	85-100	55-85	30-50	10-25
Chancellor	0-12	Silty clay loam	CL, CH, MH, ML	A-6, A-7	0	100	100	95-100	85-100	35-55	15-25
	12-31	Silty clay, silty clay loam.	CL, CH	A-7	0	100	100	95-100	85-100	40-60	15-30
	31-80	Silty clay loam, clay loam, loam.	CL, CH, ML, MH	A-6, A-7	0	100	100	85-100	70-100	35-55	15-25
Wakonda	0-13	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	85-100	30-50	10-25
	13-38	Silt loam, silty clay loam.	CL	A-6, A-7	0	95-100	95-100	90-100	85-100	30-50	10-25
	38-73	Silt loam, silty clay loam, loam.	CL	A-6, A-7	0	95-100	95-100	85-95	60-90	30-50	10-25
	73-80	Clay loam, loam	CL	A-6, A-7	0-5	95-100	90-100	85-100	55-85	30-50	10-25
WhA, WhB: Wentworth	0-10	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-100	35-50	11-25
	10-30	Silty clay loam, silt loam.	CL, CH, MH, ML	A-6, A-7	0	100	100	95-100	80-100	35-55	10-30
	30-80	Silty clay loam, silt loam.	CL, ML	A-4, A-6, A-7	0	100	95-100	85-100	60-100	30-50	5-25

Table 16.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
WhA, WhB:											
Trent-----------	0-15	Silty clay loam	CL, CH, ML, MH	A-6, A-7	0	100	100	95-100	90-100	35-55	10-30
	15-39	Silty clay loam	CL, CH	A-6, A-7	0	100	95-100	90-100	80-100	35-55	15-30
	39-46	Silt loam, silty clay loam.	CL	A-6, A-7, A-4	0	100	95-100	90-100	80-100	30-50	8-25
	46-52	Silt loam, silty clay loam.	CL, ML	A-6, A-7, A-4	0	100	90-100	85-100	70-100	30-50	8-20
	52-80	Silt loam, silty clay loam.	CL	A-6, A-7, A-4	0	100	90-100	85-100	70-100	30-45	8-20
Wk--------------- Whitewood	0-10	Silty clay loam	ML, CL	A-6, A-7	0	100	100	95-100	85-100	30-50	10-20
	10-36	Silty clay loam, silt loam.	CL, CH	A-6, A-7	0	100	100	95-100	80-100	35-55	15-30
	36-50	Silty clay loam, silt loam.	CL, CH	A-6, A-7	0	100	100	95-100	80-95	35-55	15-30
	50-80	Silty clay loam, clay loam, silt loam.	CL, CH	A-6, A-7	0	100	95-100	90-100	75-95	35-55	15-30
Wo--------------- Worthing	0-16	Silty clay loam	CL, CH	A-7	0	100	100	95-100	85-100	40-60	15-30
	16-46	Silty clay, clay	CH, MH	A-7	0	100	100	95-100	85-100	50-70	22-35
	46-80	Silty clay, silty clay loam, clay loam.	CL, CH, ML, MH	A-7	0	100	95-100	90-100	70-100	40-65	15-30
Wr:											
Worthing--------	0-16	Silty clay loam	CL, CH	A-7	0	100	100	95-100	85-100	40-60	15-30
	16-46	Silty clay, clay	CH, MH	A-7	0	100	100	95-100	85-100	50-70	22-35
	46-80	Silty clay, silty clay loam, clay loam.	CL, CH, ML, MH	A-7	0	100	95-100	90-100	70-100	40-65	15-30
Davison---------	0-8	Clay loam--------	CL	A-6, A-7	0	100	95-100	90-100	70-80	30-45	10-20
	8-41	Loam, clay loam, sandy loam.	CL, CL-ML, SC, SC-SM	A-4, A-6	0-5	95-100	95-100	85-100	45-80	25-40	5-20
	41-80	Loam, clay loam	CL-ML, CL	A-4, A-6	0-5	95-100	95-100	85-100	60-80	25-40	5-20

Table 17.--Physical and Chemical Properties of the Soils

(Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated)

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
AcA, AcB--------- Alcester	0-8	27-32	1.20-1.35	0.6-2.0	0.19-0.22	5.6-7.8	0-2	Moderate	0.28	5	7	4-8
	8-50	20-32	1.20-1.35	0.6-2.0	0.19-0.22	6.1-7.8	0-2	Moderate	0.28			
	50-80	20-32	1.30-1.45	0.6-2.0	0.17-0.20	6.6-8.4	0-2	Moderate	0.43			
Ar--------------- Arlo	0-10	20-26	1.15-1.30	0.6-2.0	0.18-0.20	6.6-8.4	0-2	Low-------	0.24	4	4L	2-4
	10-30	20-30	1.35-1.45	0.6-2.0	0.13-0.17	7.4-8.4	0-4	Low-------	0.28			
	30-80	3-10	1.60-1.80	6.0-60	0.03-0.06	7.4-8.4	0-4	Low-------	0.10			
Ba--------------- Baltic	0-7	27-40	1.15-1.25	0.2-0.6	0.16-0.20	7.4-8.4	0-2	Moderate	0.37	5	4L	4-8
	7-55	35-60	1.20-1.40	0.06-0.2	0.11-0.18	7.4-8.4	2-4	High------	0.28			
	55-80	30-50	1.25-1.45	0.06-0.6	0.08-0.17	7.4-8.4	2-4	High------	0.32			
Bb--------------- Baltic	0-7	27-40	1.15-1.25	0.2-0.6	0.16-0.20	7.4-8.4	0-2	Moderate	0.37	5	4L	4-8
	7-38	35-60	1.20-1.40	0.06-0.2	0.11-0.18	7.4-8.4	2-4	High------	0.28			
	38-80	30-50	1.25-1.45	0.06-0.6	0.08-0.17	7.4-8.4	2-4	High------	0.32			
BcA:												
Benclare---------	0-8	30-40	1.15-1.25	0.2-0.6	0.15-0.19	5.6-7.3	0-2	High------	0.28	5	7	4-6
	8-31	35-50	1.20-1.35	0.06-0.2	0.13-0.19	6.1-7.3	0-2	High------	0.28			
	31-42	35-50	1.25-1.35	0.06-0.2	0.11-0.17	6.6-8.4	0-2	High------	0.32			
	42-80	30-50	1.25-1.40	0.06-0.2	0.10-0.17	6.1-8.4	0-2	High------	0.32			
Corson----------	0-6	40-60	1.15-1.30	0.06-0.6	0.13-0.18	6.1-7.3	0-2	High------	0.28	5	4	3-6
	6-16	45-60	1.25-1.40	0.06-0.6	0.13-0.18	6.1-7.3	0-2	High------	0.28			
	16-49	45-60	1.25-1.45	0.06-0.6	0.11-0.16	7.4-8.4	0-2	High------	0.32			
	49-80	45-60	1.25-1.45	0.06-0.6	0.11-0.16	7.4-8.4	0-2	High------	0.32			
BeE:												
Betts-----------	0-5	18-27	1.20-1.30	0.6-2.0	0.16-0.18	6.6-8.4	0-2	Low-------	0.28	5	4L	1-3
	5-26	20-35	1.20-1.35	0.6-2.0	0.17-0.20	7.4-8.4	0-2	Moderate	0.32			
	26-80	20-35	1.50-1.70	0.2-0.6	0.17-0.20	7.4-8.4	2-8	Moderate	0.37			
Ethan-----------	0-9	20-27	1.20-1.30	0.6-2.0	0.18-0.20	6.6-8.4	0-2	Low-------	0.28	5	4L	1-3
	9-39	18-30	1.30-1.45	0.6-2.0	0.16-0.20	7.4-8.4	0-2	Moderate	0.32			
	39-80	18-30	1.45-1.70	0.2-2.0	0.16-0.20	7.4-9.0	2-4	Moderate	0.37			
BfA-------------- Blendon	0-12	10-18	1.25-1.35	2.0-6.0	0.11-0.17	5.6-7.3	0-2	Low-------	0.20	5	3	2-4
	12-28	10-20	1.20-1.30	0.6-6.0	0.11-0.18	6.1-7.3	0-2	Low-------	0.20			
	28-80	5-18	1.30-1.45	2.0-20	0.08-0.15	6.6-8.4	0-2	Low-------	0.24			
BhB:												
Blendon---------	0-12	10-18	1.25-1.35	2.0-6.0	0.11-0.17	5.6-7.3	0-2	Low-------	0.20	5	3	2-4
	12-28	10-20	1.20-1.30	0.6-6.0	0.11-0.18	6.1-7.3	0-2	Low-------	0.20			
	28-80	5-18	1.30-1.45	2.0-20	0.08-0.15	6.6-8.4	0-2	Low-------	0.24			
Henkin----------	0-9	10-20	1.25-1.35	2.0-6.0	0.11-0.17	5.6-7.3	0-2	Low-------	0.20	5	3	1-3
	9-25	7-18	1.20-1.45	2.0-6.0	0.09-0.18	5.6-7.8	0-2	Low-------	0.20			
	25-46	7-18	1.25-1.60	2.0-6.0	0.09-0.15	7.4-8.4	0-2	Low-------	0.24			
	46-80	3-27	1.35-1.65	0.6-6.0	0.08-0.16	6.1-8.4	0-2	Low-------	0.24			
Bo--------------- Bon	0-39	20-27	1.20-1.30	0.6-2.0	0.19-0.22	6.6-8.4	0-2	Low-------	0.24	5	6	4-6
	39-80	10-30	1.25-1.40	0.6-6.0	0.11-0.16	7.4-8.4	0-2	Low-------	0.32			
Cb--------------- Chancellor	0-12	30-40	1.15-1.25	0.06-0.6	0.13-0.19	6.1-7.3	0-2	High------	0.37	5	7	4-6
	12-31	35-55	1.20-1.35	0.06-0.2	0.11-0.19	6.1-7.8	0-2	High------	0.28			
	31-80	25-40	1.35-1.50	0.06-0.6	0.14-0.20	7.4-8.4	2-4	High------	0.43			

Table 17.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
Cc:												
Chancellor------	0-12	30-40	1.15-1.25	0.06-0.6	0.13-0.19	6.1-7.3	0-2	High------	0.37	5	7	4-6
	12-31	35-55	1.20-1.35	0.06-0.2	0.11-0.19	6.1-7.8	0-2	High------	0.28			
	31-80	25-40	1.35-1.50	0.06-0.6	0.14-0.20	7.4-8.4	2-4	High------	0.43			
Tetonka---------	0-16	20-27	1.10-1.25	0.6-2.0	0.19-0.22	5.6-7.3	0-2	Moderate	0.37	5	6	4-8
	16-20	25-35	1.15-1.25	0.2-0.6	0.19-0.22	5.6-7.3	0-2	Moderate	0.37			
	20-45	35-60	1.20-1.35	0.06-0.2	0.13-0.19	6.1-7.8	0-2	High------	0.28			
	45-80	30-50	1.35-1.50	0.06-0.6	0.11-0.17	6.6-8.4	2-8	High------	0.32			
Cd--------------- Chaska	0-6	18-27	1.30-1.60	0.6-2.0	0.22-0.24	6.6-7.8	---	Low-------	0.24	5	4L	2-5
	6-17	18-27	1.40-1.65	0.6-2.0	0.17-0.19	7.4-7.8	---	Low-------	0.28			
	17-80	2-27	1.40-1.65	2.0-6.0	0.07-0.16	7.4-8.4	---	Low-------	0.28			
Ch--------------- Chaska	0-6	20-27	1.30-1.60	0.6-2.0	0.18-0.20	6.6-7.8	0-2	Low-------	0.24	5	4L	2-5
	6-17	18-27	1.40-1.65	0.6-2.0	0.17-0.19	7.4-7.8	0-2	Low-------	0.28			
	17-80	2-27	1.40-1.65	2.0-6.0	0.07-0.16	7.4-8.4	0-2	Low-------	0.28			
Cm--------------- Clamo	0-8	40-50	1.15-1.25	0.06-0.2	0.13-0.18	5.6-7.8	0-2	High------	0.28	5	4	4-6
	8-25	35-50	1.15-1.25	0.06-0.2	0.16-0.19	6.1-7.8	2-4	High------	0.37			
	25-60	35-50	1.15-1.25	0.06-0.2	0.16-0.19	7.4-8.4	2-4	High------	0.37			
	60-80	35-50	1.20-1.35	0.06-0.2	0.13-0.18	6.6-8.4	2-8	High------	0.43			
CoB, CoC--------- Corson	0-6	40-60	1.15-1.30	0.06-0.6	0.13-0.18	6.1-7.3	0-2	High------	0.28	5	4	3-6
	6-16	45-60	1.25-1.40	0.06-0.6	0.13-0.18	6.1-7.3	0-2	High------	0.28			
	16-49	45-60	1.25-1.45	0.06-0.6	0.11-0.16	7.4-8.4	0-2	High------	0.32			
	49-80	45-60	1.25-1.45	0.06-0.6	0.11-0.16	7.4-8.4	0-2	High------	0.32			
CpC:												
Corson----------	0-8	40-60	1.15-1.30	0.06-0.6	0.13-0.18	6.1-7.3	0-2	High------	0.28	5	4	3-6
	8-14	45-60	1.25-1.40	0.06-0.6	0.13-0.18	6.6-7.8	0-2	High------	0.28			
	14-51	45-60	1.25-1.45	0.06-0.6	0.11-0.16	7.4-8.4	0-2	High------	0.32			
	51-80	27-60	1.20-1.45	0.06-2.0	0.11-0.22	7.4-8.4	0-2	High------	0.32			
Henkin----------	0-9	10-20	1.25-1.35	2.0-6.0	0.11-0.17	5.6-7.3	0-2	Low-------	0.20	5	3	1-3
	9-25	7-18	1.20-1.45	2.0-6.0	0.09-0.18	5.6-7.8	0-2	Low-------	0.20			
	25-46	7-18	1.25-1.60	2.0-6.0	0.09-0.15	7.4-8.4	0-2	Low-------	0.24			
	46-80	3-27	1.35-1.65	0.6-6.0	0.08-0.16	6.1-8.4	0-2	Low-------	0.24			
CrD, CrE:												
Crofton---------	0-6	20-27	1.20-1.30	0.6-2.0	0.21-0.24	7.4-8.4	0-2	Low-------	0.37	5	4L	.5-2
	6-80	15-27	1.10-1.20	0.6-2.0	0.18-0.22	7.4-8.4	0-2	Low-------	0.43			
Nora------------	0-9	27-35	1.20-1.25	0.6-2.0	0.19-0.22	6.1-7.3	0-2	Moderate	0.32	5	7	2-4
	9-22	20-35	1.25-1.35	0.6-2.0	0.17-0.20	6.1-7.8	0-2	Moderate	0.43			
	22-80	18-30	1.30-1.45	0.6-2.0	0.17-0.20	6.6-8.4	0-2	Moderate	0.43			
CsD:												
Crofton---------	0-6	20-27	1.20-1.30	0.6-2.0	0.21-0.24	7.4-8.4	0-2	Low-------	0.37	5	4L	.5-2
	6-80	15-27	1.10-1.20	0.6-2.0	0.18-0.22	7.4-8.4	0-2	Low-------	0.43			
Shindler--------	0-8	27-34	1.20-1.35	0.6-2.0	0.17-0.22	6.1-8.4	0-2	Moderate	0.28	5	6	1-3
	8-14	25-34	1.45-1.70	0.2-0.6	0.16-0.20	6.6-8.4	0-4	Moderate	0.37			
	14-80	25-34	1.45-1.70	0.2-0.6	0.16-0.20	7.4-8.4	0-4	Moderate	0.37			
DcA, DcB, DcC---- Davis	0-8	18-27	1.20-1.30	0.6-2.0	0.18-0.22	6.1-7.3	0-2	Low-------	0.24	5	6	4-6
	8-47	18-30	1.20-1.35	0.6-2.0	0.18-0.22	6.1-7.8	0-2	Moderate	0.24			
	47-80	18-27	1.25-1.40	0.6-2.0	0.18-0.20	7.4-8.4	0-4	Low-------	0.24			

Table 17.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
Dd:												
Davison---------	0-8	27-30	1.20-1.35	0.6-2.0	0.19-0.22	6.6-8.4	0-2	Moderate	0.28	5	4L	2-6
	8-41	18-30	1.20-1.35	0.6-2.0	0.13-0.17	7.4-9.0	0-2	Moderate	0.37			
	41-80	18-30	1.25-1.35	0.6-2.0	0.16-0.20	7.4-8.4	2-4	Moderate	0.37			
Crossplain------	0-8	27-35	1.25-1.35	0.2-0.6	0.19-0.22	6.1-7.3	0-2	Moderate	0.32	5	6	3-6
	8-24	35-45	1.25-1.45	0.06-0.6	0.11-0.17	6.1-7.3	0-2	High------	0.32			
	24-42	25-35	1.50-1.70	0.06-0.6	0.16-0.20	6.6-8.4	0-4	Moderate	0.37			
	42-80	25-35	1.50-1.70	0.06-0.6	0.16-0.20	7.4-8.4	2-8	Moderate	0.37			
DeA, DeB:												
Delmont---------	0-8	20-27	1.20-1.30	0.6-2.0	0.18-0.20	6.1-7.8	0-2	Low-------	0.28	3	6	2-4
	8-15	18-30	1.20-1.35	0.6-6.0	0.12-0.18	6.1-7.8	0-2	Low-------	0.28			
	15-80	0-5	1.60-1.75	6.0-20	0.03-0.06	7.4-8.4	0-2	Low-------	0.10			
Enet------------	0-7	20-27	1.20-1.30	0.6-2.0	0.18-0.20	5.6-7.3	0-2	Low-------	0.28	4	6	2-4
	7-23	18-30	1.20-1.35	0.6-2.0	0.18-0.22	6.6-7.8	0-2	Low-------	0.28			
	23-28	15-30	1.20-1.35	0.6-6.0	0.11-0.20	6.6-8.4	0-2	Low-------	0.28			
	28-80	0-5	1.50-1.70	6.0-20	0.03-0.06	7.4-8.4	0-2	Low-------	0.10			
DgC, DgD:												
Delmont---------	0-8	20-27	1.20-1.30	0.6-2.0	0.18-0.20	6.1-7.8	0-2	Low-------	0.28	3	6	2-4
	8-15	18-30	1.20-1.35	0.6-6.0	0.12-0.18	6.1-7.8	0-2	Low-------	0.28			
	15-80	0-5	1.60-1.75	6.0-20	0.03-0.06	7.4-8.4	0-2	Low-------	0.10			
Talmo-----------	0-7	18-25	1.20-1.45	0.6-2.0	0.18-0.20	6.6-7.8	0-2	Low-------	0.20	2	5	1-3
	7-80	0-10	1.45-1.65	6.0-60	0.03-0.06	7.4-8.4	0-2	Low-------	0.05			
DmA, DmB--------- Dempster	0-9	20-26	1.10-1.25	0.6-2.0	0.19-0.22	5.6-7.3	0-2	Moderate	0.28	4	6	3-6
	9-37	24-30	1.20-1.35	0.6-2.0	0.17-0.20	6.1-7.3	0-2	Moderate	0.32			
	37-80	1-5	1.55-1.70	2.0-20	0.03-0.06	7.4-8.4	0-2	Low-------	0.10			
DtB:												
Dempster--------	0-9	20-26	1.10-1.25	0.6-2.0	0.19-0.22	5.6-7.3	0-2	Moderate	0.28	4	6	3-6
	9-37	24-30	1.20-1.35	0.6-2.0	0.17-0.20	6.1-7.3	0-2	Moderate	0.32			
	37-80	1-5	1.55-1.70	2.0-20	0.03-0.06	7.4-8.4	0-2	Low-------	0.10			
Talmo-----------	0-7	18-25	1.20-1.45	0.6-2.0	0.18-0.20	6.6-7.8	0-2	Low-------	0.20	2	5	1-3
	7-80	0-10	1.45-1.65	6.0-60	0.03-0.06	7.4-8.4	0-2	Low-------	0.05			
Dw--------------- Dimo	0-7	27-30	1.25-1.35	0.6-2.0	0.18-0.20	5.6-7.3	0-2	Moderate	0.24	4	6	4-6
	7-39	20-34	1.30-1.40	0.6-2.0	0.16-0.20	6.1-7.8	0-2	Moderate	0.28			
	39-80	5-10	1.60-1.75	6.0-60	0.03-0.06	7.4-8.4	0-2	Low-------	0.10			
DxB-------------- Dobalt	0-8	12-26	1.30-1.45	0.6-2.0	0.18-0.22	5.6-7.3	0-2	Low-------	0.24	5	6	3-6
	8-19	18-27	1.30-1.45	0.6-2.0	0.18-0.20	6.1-7.8	0-2	Low-------	0.28			
	19-29	18-30	1.30-1.45	0.6-2.0	0.18-0.20	6.1-7.8	0-2	Low-------	0.32			
	29-80	24-35	1.45-1.70	0.2-0.6	0.16-0.20	7.4-8.4	0-4	Moderate	0.32			
DyA:												
Dobalt----------	0-8	12-26	1.30-1.45	0.6-2.0	0.18-0.22	5.6-7.3	0-2	Low-------	0.24	5	6	3-6
	8-19	18-27	1.30-1.45	0.6-2.0	0.18-0.20	6.1-7.8	0-2	Low-------	0.28			
	19-29	18-30	1.30-1.45	0.6-2.0	0.18-0.20	6.1-7.8	0-2	Low-------	0.32			
	29-80	24-35	1.45-1.70	0.2-0.6	0.16-0.20	7.4-8.4	0-4	Moderate	0.32			
Bonilla---------	0-11	20-27	1.15-1.30	0.6-2.0	0.17-0.19	5.6-7.3	0-2	Low-------	0.24	5	6	4-6
	11-32	18-30	1.20-1.35	0.6-2.0	0.18-0.22	6.1-7.8	0-2	Moderate	0.28			
	32-45	18-30	1.25-1.35	0.2-2.0	0.16-0.20	7.4-8.4	0-4	Moderate	0.32			
	45-80	18-30	1.25-1.35	0.2-2.0	0.16-0.20	7.4-8.4	0-8	Moderate	0.37			

Table 17.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
EaB:												
Egan------------	0-10	27-35	1.15-1.25	0.6-2.0	0.19-0.22	6.1-7.3	0-2	Moderate	0.28	5	7	3-6
	10-28	25-35	1.20-1.35	0.6-2.0	0.17-0.20	6.1-7.8	0-2	Moderate	0.43			
	28-43	25-35	1.50-1.70	0.2-0.6	0.17-0.20	7.4-8.4	0-4	Moderate	0.37			
	43-80	25-35	1.50-1.70	0.2-0.6	0.17-0.20	7.4-9.0	2-8	Moderate	0.37			
Ethan-----------	0-9	20-27	1.20-1.30	0.6-2.0	0.18-0.20	6.6-8.4	0-2	Low--------	0.28	5	4L	1-3
	9-39	18-30	1.30-1.45	0.6-2.0	0.16-0.20	7.4-8.4	0-2	Moderate	0.32			
	39-80	18-30	1.45-1.70	0.2-2.0	0.16-0.20	7.4-9.0	2-4	Moderate	0.37			
EeB:												
Egan------------	0-10	27-35	1.15-1.25	0.6-2.0	0.19-0.22	6.1-7.3	0-2	Moderate	0.28	5	7	3-6
	10-28	25-35	1.20-1.35	0.6-2.0	0.17-0.20	6.1-7.8	0-2	Moderate	0.43			
	28-43	25-35	1.50-1.70	0.2-0.6	0.17-0.20	7.4-8.4	0-4	Moderate	0.37			
	43-80	25-35	1.50-1.70	0.2-0.6	0.17-0.20	7.4-9.0	2-8	Moderate	0.37			
Ethan-----------	0-9	20-27	1.20-1.30	0.6-2.0	0.18-0.20	6.6-8.4	0-2	Low--------	0.28	5	4L	1-3
	9-39	18-30	1.30-1.45	0.6-2.0	0.16-0.20	7.4-8.4	0-2	Moderate	0.32			
	39-80	18-30	1.45-1.70	0.2-2.0	0.16-0.20	7.4-9.0	2-4	Moderate	0.37			
Trent-----------	0-15	27-35	1.15-1.25	0.6-2.0	0.19-0.22	5.6-7.3	0-2	Moderate	0.28	5	7	4-6
	15-39	27-35	1.20-1.35	0.6-2.0	0.17-0.20	6.1-7.3	0-2	Moderate	0.32			
	39-46	25-33	1.25-1.40	0.6-2.0	0.17-0.20	6.1-7.3	0-2	Moderate	0.43			
	46-52	20-30	1.30-1.45	0.6-2.0	0.17-0.20	7.4-8.4	0-2	Moderate	0.43			
	52-80	20-30	1.30-1.45	0.6-2.0	0.17-0.20	6.6-8.4	2-4	Moderate	0.43			
EfA:												
Egan------------	0-10	27-35	1.15-1.25	0.6-2.0	0.19-0.22	6.1-7.3	0-2	Moderate	0.28	5	7	3-6
	10-28	25-35	1.20-1.35	0.6-2.0	0.17-0.20	6.1-7.8	0-2	Moderate	0.43			
	28-43	25-35	1.50-1.70	0.2-0.6	0.17-0.20	7.4-8.4	0-4	Moderate	0.37			
	43-80	25-35	1.50-1.70	0.2-0.6	0.17-0.20	7.4-9.0	2-8	Moderate	0.37			
Trent-----------	0-15	27-35	1.15-1.25	0.6-2.0	0.19-0.22	5.6-7.3	0-2	Moderate	0.28	5	7	4-6
	15-39	27-35	1.20-1.35	0.6-2.0	0.17-0.20	6.1-7.3	0-2	Moderate	0.32			
	39-46	25-33	1.25-1.40	0.6-2.0	0.17-0.20	6.1-7.3	0-2	Moderate	0.43			
	46-52	20-30	1.30-1.45	0.6-2.0	0.17-0.20	7.4-8.4	0-2	Moderate	0.43			
	52-80	20-30	1.30-1.45	0.6-2.0	0.17-0.20	6.6-8.4	2-4	Moderate	0.43			
EgB:												
Egan------------	0-10	27-35	1.15-1.25	0.6-2.0	0.19-0.22	6.1-7.3	0-2	Moderate	0.28	5	7	3-6
	10-28	25-35	1.20-1.35	0.6-2.0	0.17-0.20	6.1-7.8	0-2	Moderate	0.43			
	28-43	25-35	1.50-1.70	0.2-0.6	0.17-0.20	7.4-8.4	0-4	Moderate	0.37			
	43-80	25-35	1.50-1.70	0.2-0.6	0.17-0.20	7.4-9.0	2-8	Moderate	0.37			
Wentworth-------	0-10	27-35	1.15-1.25	0.6-2.0	0.19-0.22	5.6-7.3	0-2	Moderate	0.28	5	7	3-6
	10-26	25-35	1.20-1.35	0.6-2.0	0.18-0.21	6.1-7.3	0-2	Moderate	0.43			
	26-55	20-30	1.30-1.45	0.6-2.0	0.17-0.20	7.4-8.4	0-2	Moderate	0.43			
	55-80	25-34	1.50-1.70	0.2-0.6	0.16-0.20	7.4-8.4	2-4	Moderate	0.37			
Trent-----------	0-15	27-35	1.15-1.25	0.6-2.0	0.19-0.22	5.6-7.3	0-2	Moderate	0.28	5	7	4-6
	15-39	27-35	1.20-1.35	0.6-2.0	0.17-0.20	6.1-7.3	0-2	Moderate	0.32			
	39-46	25-33	1.25-1.40	0.6-2.0	0.17-0.20	6.1-7.3	0-2	Moderate	0.43			
	46-52	20-30	1.30-1.45	0.6-2.0	0.17-0.20	7.4-8.4	0-2	Moderate	0.43			
	52-80	20-30	1.30-1.45	0.6-2.0	0.17-0.20	6.6-8.4	2-4	Moderate	0.43			
EnA-------------- Enet	0-7	20-27	1.20-1.30	0.6-2.0	0.18-0.20	5.6-7.3	0-2	Low--------	0.24	4	6	3-6
	7-23	18-30	1.20-1.35	0.6-2.0	0.18-0.22	6.6-7.8	0-2	Low--------	0.28			
	23-28	15-30	1.20-1.35	0.6-6.0	0.11-0.20	6.6-8.4	0-2	Low--------	0.28			
	28-80	0-5	1.50-1.70	6.0-60	0.03-0.06	7.4-8.4	0-2	Low--------	0.10			

Table 17.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
EoA:												
Enet------------	0-7	20-27	1.20-1.30	0.6-2.0	0.18-0.20	5.6-7.3	0-2	Low-------	0.24	4	6	3-6
	7-23	18-30	1.20-1.35	0.6-2.0	0.18-0.22	6.6-7.8	0-2	Low-------	0.28			
	23-28	15-30	1.20-1.35	0.6-6.0	0.11-0.20	6.6-8.4	0-2	Low-------	0.28			
	28-80	0-5	1.50-1.70	6.0-60	0.03-0.06	7.4-8.4	0-2	Low-------	0.10			
Dimo------------	0-7	27-30	1.25-1.35	0.6-2.0	0.18-0.20	5.6-7.3	0-2	Moderate	0.24	4	6	4-6
	7-39	20-34	1.30-1.40	0.6-2.0	0.16-0.20	6.1-7.8	0-2	Moderate	0.28			
	39-80	5-10	1.60-1.75	6.0-60	0.03-0.06	7.4-8.4	0-2	Low-------	0.10			
EpD:												
Ethan-----------	0-9	20-27	1.20-1.30	0.6-2.0	0.18-0.20	6.6-8.4	0-2	Low-------	0.28	5	4L	1-3
	9-39	18-30	1.30-1.45	0.6-2.0	0.16-0.20	7.4-8.4	0-2	Moderate	0.32			
	39-80	18-30	1.45-1.70	0.2-2.0	0.16-0.20	7.4-9.0	2-4	Moderate	0.37			
Betts-----------	0-5	18-27	1.20-1.30	0.6-2.0	0.16-0.18	6.6-8.4	0-2	Low-------	0.28	5	4L	1-3
	5-26	20-35	1.20-1.35	0.6-2.0	0.17-0.20	7.4-8.4	0-2	Moderate	0.32			
	26-80	20-35	1.50-1.70	0.2-0.6	0.17-0.20	7.4-8.4	2-8	Moderate	0.37			
EsE:												
Ethan-----------	0-9	18-25	1.20-1.30	0.6-2.0	0.11-0.15	6.1-7.8	0-2	Low-------	0.20	5	8	1-3
	9-39	20-30	1.30-1.45	0.6-2.0	0.16-0.20	7.4-8.4	0-2	Moderate	0.32			
	39-80	20-30	1.45-1.70	0.2-0.6	0.16-0.20	7.4-9.0	2-4	Moderate	0.37			
Clarno----------	0-10	18-25	1.20-1.30	0.6-2.0	0.17-0.19	6.1-7.3	0-2	Low-------	0.17	5	8	2-4
	10-22	20-30	1.25-1.40	0.6-2.0	0.16-0.20	6.1-7.8	0-2	Moderate	0.28			
	22-44	20-30	1.25-1.40	0.6-2.0	0.16-0.20	7.4-8.4	0-4	Moderate	0.37			
	44-80	20-30	1.50-1.70	0.2-0.6	0.16-0.20	7.4-9.0	2-8	Moderate	0.37			
EtD:												
Ethan-----------	0-9	20-27	1.20-1.30	0.6-2.0	0.18-0.20	6.6-8.4	0-2	Low-------	0.28	5	4L	1-3
	9-39	18-30	1.30-1.45	0.6-2.0	0.16-0.20	7.4-8.4	0-2	Moderate	0.32			
	39-80	18-30	1.45-1.70	0.2-2.0	0.16-0.20	7.4-9.0	2-4	Moderate	0.37			
Clarno----------	0-10	20-27	1.20-1.30	0.6-2.0	0.17-0.19	6.1-7.3	0-2	Low-------	0.24	5	6	2-4
	10-22	20-30	1.25-1.40	0.6-2.0	0.16-0.20	6.1-7.8	0-2	Moderate	0.28			
	22-44	20-30	1.25-1.40	0.6-2.0	0.16-0.20	7.4-8.4	0-4	Moderate	0.37			
	44-80	20-30	1.50-1.70	0.2-0.6	0.16-0.20	7.4-9.0	2-8	Moderate	0.37			
EuC:												
Ethan-----------	0-9	20-27	1.20-1.30	0.6-2.0	0.18-0.20	6.6-8.4	0-2	Low-------	0.28	5	4L	1-3
	9-39	18-30	1.30-1.45	0.6-2.0	0.16-0.20	7.4-8.4	0-2	Moderate	0.32			
	39-80	18-30	1.45-1.70	0.2-2.0	0.16-0.20	7.4-9.0	2-4	Moderate	0.37			
Egan------------	0-10	27-35	1.15-1.25	0.6-2.0	0.19-0.22	6.1-7.3	0-2	Moderate	0.28	5	7	3-6
	10-28	25-35	1.20-1.35	0.6-2.0	0.17-0.20	6.1-7.8	0-2	Moderate	0.43			
	28-43	25-35	1.50-1.70	0.2-0.6	0.17-0.20	7.4-8.4	0-4	Moderate	0.37			
	43-80	25-35	1.50-1.70	0.2-0.6	0.17-0.20	7.4-9.0	2-8	Moderate	0.37			
ExC:												
Ethan-----------	0-9	18-25	1.20-1.30	0.6-2.0	0.11-0.15	6.1-7.8	0-2	Low-------	0.20	5	8	1-3
	9-39	20-30	1.30-1.45	0.6-2.0	0.16-0.20	7.4-8.4	0-2	Moderate	0.32			
	39-80	20-30	1.45-1.70	0.2-0.6	0.16-0.20	7.4-9.0	2-4	Moderate	0.37			
Egan------------	0-10	27-35	1.15-1.25	0.6-2.0	0.19-0.22	6.1-7.3	0-2	Moderate	0.28	5	7	3-6
	10-28	25-35	1.20-1.35	0.6-2.0	0.17-0.20	6.1-7.8	0-2	Moderate	0.43			
	28-43	25-35	1.50-1.70	0.2-0.6	0.17-0.20	7.4-8.4	0-4	Moderate	0.37			
	43-80	25-35	1.50-1.70	0.2-0.6	0.17-0.20	7.4-9.0	2-8	Moderate	0.37			

Table 17.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
FaA, FaB--------- Flandreau	0-7	20-26	1.20-1.35	0.6-2.0	0.18-0.20	5.6-7.3	0-2	Low-------	0.24	4	6	3-6
	7-33	20-30	1.20-1.35	0.6-2.0	0.16-0.22	6.1-7.3	0-2	Moderate	0.32			
	33-39	10-18	1.35-1.45	2.0-6.0	0.09-0.13	6.6-7.8	0-2	Low-------	0.24			
	39-78	3-10	1.50-1.70	6.0-20	0.06-0.10	7.4-8.4	0-2	Low-------	0.17			
	78-80	20-30	1.20-1.35	0.2-0.6	0.18-0.20	7.4-8.4	0-2	Moderate	0.37			
FtB:												
Flandreau-------	0-7	20-26	1.20-1.35	0.6-2.0	0.18-0.20	5.6-7.3	0-2	Low-------	0.24	4	6	3-6
	7-33	20-30	1.20-1.35	0.6-2.0	0.16-0.22	6.1-7.3	0-2	Moderate	0.32			
	33-39	10-18	1.35-1.45	2.0-6.0	0.09-0.13	6.6-7.8	0-2	Low-------	0.24			
	39-78	3-10	1.50-1.70	6.0-20	0.06-0.10	7.4-8.4	0-2	Low-------	0.17			
	78-80	20-30	1.20-1.35	0.2-0.6	0.18-0.20	7.4-8.4	0-2	Moderate	0.37			
Thurman---------	0-10	8-18	1.40-1.60	2.0-6.0	0.16-0.18	5.6-7.3	---	Low-------	0.20	5	3	1-2
	10-31	5-12	1.60-1.70	6.0-20	0.08-0.10	5.6-7.3	---	Low-------	0.17			
	31-80	2-7	1.60-1.70	6.0-20	0.05-0.07	5.6-8.4	---	Low-------	0.15			
GrA------------- Graceville	0-18	27-34	1.15-1.25	0.6-2.0	0.19-0.22	5.6-7.3	0-2	Moderate	0.28	4	7	4-8
	18-52	25-34	1.20-1.35	0.6-2.0	0.17-0.22	5.6-7.3	0-2	Moderate	0.32			
	52-80	2-10	1.50-1.70	6.0-20	0.03-0.06	6.1-7.8	0-2	Low-------	0.10			
GsB------------- Grovena	0-9	18-27	1.15-1.30	0.6-2.0	0.17-0.20	5.6-6.5	0-2	Low-------	0.24	5	6	2-4
	9-13	18-30	1.20-1.35	0.6-2.0	0.18-0.22	6.1-7.3	0-2	Low-------	0.28			
	13-30	18-25	1.25-1.45	0.6-2.0	0.14-0.18	6.1-7.3	0-2	Low-------	0.32			
	30-36	18-27	1.35-1.50	0.6-2.0	0.14-0.18	7.4-8.4	0-2	Low-------	0.43			
	36-80	15-30	1.40-1.70	0.6-2.0	0.14-0.19	7.4-8.4	0-4	Moderate	0.43			
GvA:												
Grovena---------	0-9	18-27	1.15-1.30	0.6-2.0	0.17-0.20	5.6-6.5	0-2	Low-------	0.24	5	6	2-4
	9-13	18-30	1.20-1.35	0.6-2.0	0.18-0.22	6.1-7.3	0-2	Low-------	0.28			
	13-30	18-25	1.25-1.45	0.6-2.0	0.14-0.18	6.1-7.3	0-2	Low-------	0.32			
	30-36	18-27	1.35-1.50	0.6-2.0	0.14-0.18	7.4-8.4	0-2	Low-------	0.43			
	36-80	15-30	1.40-1.70	0.6-2.0	0.14-0.19	7.4-8.4	0-4	Moderate	0.43			
Bonilla---------	0-11	20-27	1.15-1.30	0.6-2.0	0.17-0.19	5.6-7.3	0-2	Low-------	0.24	5	6	4-6
	11-32	18-30	1.20-1.35	0.6-2.0	0.18-0.22	6.1-7.8	0-2	Moderate	0.28			
	32-45	18-30	1.25-1.35	0.2-2.0	0.16-0.20	7.4-8.4	0-4	Moderate	0.32			
	45-80	18-30	1.25-1.35	0.2-2.0	0.16-0.20	7.4-8.4	0-8	Moderate	0.37			
HoB------------- Houdek	0-6	27-30	1.20-1.30	0.6-2.0	0.16-0.22	6.1-7.3	0-2	Moderate	0.24	5	6	2-4
	6-17	27-35	1.25-1.35	0.6-2.0	0.16-0.22	6.6-7.8	0-2	Moderate	0.28			
	17-33	25-35	1.25-1.40	0.6-2.0	0.17-0.20	7.4-8.4	0-2	Moderate	0.28			
	33-80	20-30	1.50-1.70	0.2-0.6	0.17-0.20	7.4-8.4	0-8	Moderate	0.37			
HsC, HsD:												
Houdek----------	0-6	27-30	1.20-1.30	0.6-2.0	0.16-0.22	6.1-7.3	0-2	Moderate	0.24	5	6	2-4
	6-17	27-35	1.25-1.35	0.6-2.0	0.16-0.22	6.6-7.8	0-2	Moderate	0.28			
	17-33	25-35	1.25-1.40	0.6-2.0	0.17-0.20	7.4-8.4	0-2	Moderate	0.28			
	33-80	20-30	1.50-1.70	0.2-0.6	0.17-0.20	7.4-8.4	0-8	Moderate	0.37			
Shindler--------	0-8	27-34	1.20-1.35	0.6-2.0	0.17-0.22	6.1-8.4	0-2	Moderate	0.28	5	6	1-3
	8-14	25-34	1.45-1.70	0.2-0.6	0.16-0.20	6.6-8.4	0-4	Moderate	0.37			
	14-80	25-34	1.45-1.70	0.2-0.6	0.16-0.20	7.4-8.4	0-4	Moderate	0.37			
HtD:												
Houdek----------	0-6	27-30	1.20-1.30	0.6-2.0	0.16-0.22	6.1-7.3	0-2	Moderate	0.24	5	6	2-4
	6-17	27-35	1.25-1.35	0.6-2.0	0.16-0.22	6.6-7.8	0-2	Moderate	0.28			
	17-33	25-35	1.25-1.40	0.6-2.0	0.17-0.20	7.4-8.4	0-2	Moderate	0.28			
	33-80	20-30	1.50-1.70	0.2-0.6	0.17-0.20	7.4-8.4	0-8	Moderate	0.37			
Talmo-----------	0-7	18-25	1.20-1.45	0.6-2.0	0.18-0.20	6.6-7.8	0-2	Low-------	0.20	2	5	1-3
	7-80	0-10	1.45-1.65	6.0-60	0.03-0.06	7.4-8.4	0-2	Low-------	0.05			

Table 17.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
HuA, HuB--------- Huntimer	0-7	35-40	1.20-1.30	0.06-0.2	0.16-0.19	5.6-7.3	0-2	High------	0.37	5	4	3-6
	7-18	35-50	1.20-1.35	0.06-0.2	0.11-0.19	6.1-7.8	0-2	High------	0.28			
	18-38	35-50	1.30-1.40	0.06-0.2	0.11-0.20	7.4-8.4	0-2	High------	0.37			
	38-80	25-40	1.25-1.45	0.06-0.6	0.11-0.20	7.4-8.4	0-4	High------	0.28			
IhA-------------- Ihlen	0-11	27-35	1.20-1.30	0.6-2.0	0.18-0.22	6.1-7.3	---	Moderate	0.32	2	7	2-4
	11-25	27-35	1.20-1.30	0.6-2.0	0.16-0.19	6.1-7.3	---	Moderate	0.32			
	25-35	18-27	1.20-1.45	0.6-2.0	0.20-0.22	6.6-8.4	---	Low-------	0.43			
	35-80	---	---	0.01-20	---	---	---	----------	----			
IrB, IrE: Ihlen-----------	0-11	27-35	1.20-1.30	0.6-2.0	0.18-0.22	6.1-7.3	---	Moderate	0.32	2	7	2-4
	11-25	27-35	1.20-1.30	0.6-2.0	0.16-0.19	6.1-7.3	---	Moderate	0.32			
	25-35	18-27	1.20-1.45	0.6-2.0	0.20-0.22	6.6-8.4	---	Low-------	0.43			
	35-80	---	---	0.01-20	---	---	---	----------	----			
Rock outcrop.												
Ja--------------- Janude	0-19	5-15	1.50-1.60	2.0-6.0	0.16-0.18	6.6-7.8	---	Low-------	0.20	5	3	2-4
	19-43	7-20	1.50-1.60	0.6-2.0	0.17-0.19	6.6-8.4	---	Low-------	0.20			
	43-80	7-30	1.40-1.70	0.6-6.0	0.14-0.20	6.6-8.4	---	Moderate	0.20			
La--------------- Lamo	0-7	18-35	1.30-1.60	0.2-2.0	0.19-0.23	7.4-8.4	---	Moderate	0.28	5	4L	1-3
	7-80	25-35	1.30-1.50	0.2-0.6	0.18-0.22	7.4-8.4	---	Moderate	0.43			
Lb--------------- Lamo	0-7	18-35	1.30-1.60	0.2-2.0	0.19-0.23	7.4-8.4	---	Moderate	0.28	5	4L	2-5
	7-80	25-35	1.30-1.50	0.2-0.6	0.18-0.22	7.4-8.4	---	Moderate	0.43			
M-W. Miscellaneous water												
MdB-------------- Moody	0-11	27-35	1.25-1.30	0.2-2.0	0.19-0.22	5.6-7.3	0-2	Moderate	0.28	5	7	2-4
	11-35	24-35	1.20-1.30	0.6-2.0	0.17-0.20	5.6-7.3	0-2	Moderate	0.32			
	35-50	20-30	1.30-1.45	0.6-2.0	0.17-0.20	7.4-8.4	0-2	Moderate	0.43			
	50-80	18-25	1.30-1.50	0.6-2.0	0.17-0.20	7.4-8.4	0-2	Low-------	0.43			
MgA: Moody-----------	0-11	27-35	1.25-1.30	0.2-2.0	0.19-0.22	5.6-7.3	0-2	Moderate	0.28	5	7	2-4
	11-35	24-35	1.20-1.30	0.6-2.0	0.17-0.20	5.6-7.3	0-2	Moderate	0.32			
	35-50	20-30	1.30-1.45	0.6-2.0	0.17-0.20	7.4-8.4	0-2	Moderate	0.43			
	50-80	18-25	1.30-1.50	0.6-2.0	0.17-0.20	7.4-8.4	0-2	Low-------	0.43			
Gayville--------	0-2	20-27	1.15-1.20	0.6-2.0	0.17-0.20	6.1-9.0	0-2	Low-------	0.37	2	6	2-5
	2-13	35-45	1.35-1.45	0.00-0.06	0.10-0.16	7.4-9.0	4-16	High------	0.28			
	13-26	27-35	1.30-1.40	0.2-0.6	0.14-0.16	7.9-9.6	4-16	Moderate	0.43			
	26-80	5-30	1.35-1.50	0.2-2.0	0.15-0.17	7.9-9.6	4-16	Low-------	0.43			
MnB, MnC: Moody-----------	0-11	27-35	1.25-1.30	0.2-2.0	0.19-0.22	5.6-7.3	0-2	Moderate	0.28	5	7	2-4
	11-35	24-35	1.20-1.30	0.6-2.0	0.17-0.20	5.6-7.3	0-2	Moderate	0.32			
	35-50	20-30	1.30-1.45	0.6-2.0	0.17-0.20	7.4-8.4	0-2	Moderate	0.43			
	50-80	18-25	1.30-1.50	0.6-2.0	0.17-0.20	7.4-8.4	0-2	Low-------	0.43			
Nora------------	0-9	27-35	1.20-1.25	0.6-2.0	0.19-0.22	6.1-7.3	0-2	Moderate	0.32	5	7	2-4
	9-22	20-35	1.25-1.35	0.6-2.0	0.17-0.20	6.1-7.8	0-2	Moderate	0.43			
	22-80	18-30	1.30-1.45	0.6-2.0	0.17-0.20	6.6-8.4	0-2	Moderate	0.43			

Table 17.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
MtA:												
Moody-----------	0-11	27-35	1.25-1.30	0.2-2.0	0.19-0.22	5.6-7.3	0-2	Moderate	0.28	5	7	2-4
	11-35	24-35	1.20-1.30	0.6-2.0	0.17-0.20	5.6-7.3	0-2	Moderate	0.32			
	35-50	20-30	1.30-1.45	0.6-2.0	0.17-0.20	7.4-8.4	0-2	Moderate	0.43			
	50-80	18-25	1.30-1.50	0.6-2.0	0.17-0.20	7.4-8.4	0-2	Low-------	0.43			
Trent-----------	0-15	27-35	1.15-1.25	0.6-2.0	0.19-0.22	5.6-7.3	0-2	Moderate	0.28	5	7	4-6
	15-39	27-35	1.20-1.35	0.6-2.0	0.17-0.20	6.1-7.3	0-2	Moderate	0.32			
	39-46	25-33	1.25-1.40	0.6-2.0	0.17-0.20	6.1-7.3	0-2	Moderate	0.43			
	46-52	20-30	1.30-1.45	0.6-2.0	0.17-0.20	7.4-8.4	0-2	Moderate	0.43			
	52-80	20-30	1.30-1.45	0.6-2.0	0.17-0.20	6.6-8.4	2-4	Moderate	0.43			
NcC:												
Nora------------	0-9	27-35	1.20-1.25	0.6-2.0	0.19-0.22	6.1-7.3	0-2	Moderate	0.32	5	7	2-4
	9-22	20-35	1.25-1.35	0.6-2.0	0.17-0.20	6.1-7.8	0-2	Moderate	0.43			
	22-80	18-30	1.30-1.45	0.6-2.0	0.17-0.20	6.6-8.4	0-2	Moderate	0.43			
Crofton---------	0-6	20-27	1.20-1.30	0.6-2.0	0.21-0.24	7.4-8.4	0-2	Low-------	0.37	5	4L	.5-2
	6-80	15-27	1.10-1.20	0.6-2.0	0.18-0.22	7.4-8.4	0-2	Low-------	0.43			
Ob--------------- Obert	0-13	27-35	1.20-1.35	0.2-0.6	0.21-0.23	7.4-8.4	0-2	High------	0.28	5	8	2-4
	13-52	18-35	1.20-1.35	0.2-0.6	0.18-0.20	7.4-8.4	0-2	High------	0.32			
	52-80	18-35	1.30-1.40	0.2-2.0	0.17-0.20	7.4-8.4	0-2	Moderate	0.43			
Og--------------- Orthents	0-18	10-20	1.25-1.40	2.0-6.0	0.11-0.20	6.1-7.8	0-2	Low-------	0.20	3	5	.5-3
	18-80	0-5	1.60-1.80	6.0-60	0.03-0.06	7.4-8.4	0-2	Low-------	0.10			
Or--------------- Orthents	0-6	27-35	1.20-1.50	0.2-0.6	0.18-0.23	6.6-8.4	0-2	Moderate	0.28	5	4L	1-3
	6-80	18-35	1.30-1.60	0.2-0.6	0.14-0.19	7.4-8.4	0-4	Moderate	0.37			
Ow:												
Orthents--------	0-18	10-20	1.25-1.40	2.0-6.0	0.11-0.20	6.1-7.8	0-2	Low-------	0.20	3	5	.5-3
	18-80	0-5	1.60-1.80	6.0-60	0.03-0.06	7.4-8.4	0-2	Low-------	0.10			
Aquents---------	0-8	10-20	1.25-1.40	2.0-6.0	0.11-0.20	6.1-7.8	0-2	Low-------	0.20	2	8	1-3
	8-80	0-5	1.60-1.80	6.0-20	0.03-0.06	7.4-8.4	0-2	Low-------	0.10			
Pt--------------- Pits, quarry	0-80	0-1	2.00-2.35	0.01-0.06	0.0-0.06	5.6-7.3	0-2	Low-------	0.02	1	8	0-1
Sa--------------- Salmo	0-17	27-35	1.15-1.25	0.2-0.6	0.19-0.24	6.6-8.4	4-16	Moderate	0.28	5	4L	3-6
	17-49	25-35	1.20-1.40	0.2-2.0	0.17-0.20	6.6-8.4	4-16	Moderate	0.28			
	49-80	15-35	1.20-1.35	0.6-6.0	0.11-0.20	6.6-8.4	4-16	Low-------	0.24			
SdE:												
Shindler--------	0-8	27-34	1.20-1.35	0.6-2.0	0.17-0.22	6.1-8.4	0-2	Moderate	0.28	5	6	1-3
	8-14	25-34	1.45-1.70	0.2-0.6	0.16-0.20	6.6-8.4	0-4	Moderate	0.37			
	14-80	25-34	1.45-1.70	0.2-0.6	0.16-0.20	7.4-8.4	0-4	Moderate	0.37			
Houdek----------	0-6	27-30	1.20-1.30	0.6-2.0	0.16-0.22	6.1-7.3	0-2	Moderate	0.24	5	6	2-4
	6-17	27-35	1.25-1.35	0.6-2.0	0.16-0.22	6.6-7.8	0-2	Moderate	0.28			
	17-33	25-35	1.25-1.40	0.6-2.0	0.17-0.20	7.4-8.4	0-2	Moderate	0.28			
	33-80	20-30	1.50-1.70	0.2-0.6	0.17-0.20	7.4-8.4	0-8	Moderate	8.37			
SnE:												
Shindler--------	0-8	27-34	1.20-1.35	0.6-2.0	0.17-0.22	6.1-8.4	0-2	Moderate	0.28	5	6	1-3
	8-14	25-34	1.45-1.70	0.2-0.6	0.16-0.20	6.6-8.4	0-4	Moderate	0.37			
	14-80	25-34	1.45-1.70	0.2-0.6	0.16-0.20	7.4-8.4	0-4	Moderate	0.37			
Talmo-----------	0-7	18-25	1.20-1.45	0.6-2.0	0.18-0.20	6.6-7.8	0-2	Low-------	0.20	2	5	1-3
	7-80	0-10	1.45-1.65	6.0-60	0.03-0.06	7.4-8.4	0-2	Low-------	0.05			

Table 17.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors		Wind erodi- bility group	Organic matter
									K	T		
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
SpA, SpB---------	0-9	27-35	1.15-1.25	0.6-2.0	0.19-0.22	5.1-7.3	0-2	Moderate	0.28	5	7	3-6
Splitrock	9-34	25-35	1.20-1.35	0.6-2.0	0.17-0.20	6.1-7.8	0-2	Moderate	0.43			
	34-51	25-35	1.50-1.70	0.06-0.6	0.17-0.20	7.4-8.4	0-4	Moderate	0.37			
	51-80	25-38	1.50-1.70	0.06-0.6	0.17-0.20	7.4-9.0	2-8	Moderate	0.37			
SsF:												
Steinauer-------	0-4	27-32	1.20-1.35	0.2-0.6	0.19-0.22	7.4-8.4	---	Moderate	0.32	5	4L	.5-2
	4-13	27-32	1.30-1.50	0.2-0.6	0.17-0.19	7.9-8.4	---	Moderate	0.37			
	13-80	24-35	1.30-1.65	0.2-0.6	0.16-0.19	7.9-8.4	---	Moderate	0.37			
Shindler--------	0-8	27-34	1.20-1.35	0.6-2.0	0.17-0.22	6.1-8.4	0-2	Moderate	0.28	5	6	1-3
	8-14	25-34	1.45-1.70	0.2-0.6	0.16-0.20	6.6-8.4	0-4	Moderate	0.37			
	14-80	25-34	1.45-1.70	0.2-0.6	0.16-0.20	7.4-8.4	0-4	Moderate	0.37			
TdE:												
Talmo-----------	0-7	18-25	1.20-1.45	0.6-2.0	0.18-0.20	6.6-7.8	0-2	Low-------	0.20	2	5	1-3
	7-80	0-10	1.45-1.65	6.0-60	0.03-0.06	7.4-8.4	0-2	Low-------	0.05			
Delmont---------	0-8	20-27	1.20-1.30	0.6-2.0	0.18-0.20	6.1-7.8	0-2	Low-------	0.28	3	6	2-4
	8-15	18-30	1.20-1.35	0.6-6.0	0.12-0.18	6.1-7.8	0-2	Low-------	0.28			
	15-80	0-5	1.60-1.75	6.0-20	0.03-0.06	7.4-8.4	0-2	Low-------	0.10			
Te---------------	0-16	20-27	1.10-1.25	0.6-2.0	0.19-0.22	5.6-7.3	0-2	Moderate	0.37	5	6	4-8
Tetonka	16-20	25-35	1.15-1.25	0.2-0.6	0.19-0.22	5.6-7.3	0-2	Moderate	0.37			
	20-45	35-60	1.20-1.35	0.06-0.2	0.13-0.19	6.1-7.8	0-2	High------	0.28			
	45-80	30-50	1.35-1.50	0.06-0.6	0.11-0.17	6.6-8.4	2-8	High------	0.32			
TfC:												
Thurman---------	0-10	8-18	1.40-1.60	2.0-6.0	0.16-0.18	5.6-7.3	---	Low-------	0.20	5	3	1-2
	10-31	5-12	1.60-1.70	6.0-20	0.08-0.10	5.6-7.3	---	Low-------	0.17			
	31-80	2-7	1.60-1.70	6.0-20	0.05-0.07	5.6-8.4	---	Low-------	0.15			
Flandreau-------	0-7	20-26	1.20-1.35	0.6-2.0	0.18-0.20	5.6-7.3	0-2	Low-------	0.24	4	6	3-6
	7-33	20-30	1.20-1.35	0.6-2.0	0.16-0.22	6.1-7.3	0-2	Moderate	0.32			
	33-39	10-18	1.35-1.45	2.0-6.0	0.09-0.13	6.6-7.8	0-2	Low-------	0.24			
	39-78	3-10	1.50-1.70	6.0-20	0.06-0.10	7.4-8.4	0-2	Low-------	0.17			
	78-80	20-30	1.20-1.35	0.2-0.6	0.18-0.20	7.4-8.4	0-2	Moderate	0.37			
TgD:												
Thurman---------	0-10	8-18	1.40-1.60	2.0-6.0	0.16-0.18	5.6-7.3	---	Low-------	0.20	5	3	1-2
	10-31	5-12	1.60-1.70	6.0-20	0.08-0.10	5.6-7.3	---	Low-------	0.17			
	31-80	2-7	1.60-1.70	6.0-20	0.05-0.07	5.6-8.4	---	Low-------	0.15			
Grovena---------	0-9	18-27	1.15-1.30	0.6-2.0	0.17-0.20	5.6-6.5	0-2	Low-------	0.24	5	6	2-4
	9-13	18-30	1.20-1.35	0.6-2.0	0.18-0.22	6.1-7.3	0-2	Low-------	0.28			
	13-30	18-25	1.25-1.45	0.6-2.0	0.14-0.18	6.1-7.3	0-2	Low-------	0.32			
	30-36	18-27	1.35-1.50	0.6-2.0	0.14-0.18	7.4-8.4	0-2	Low-------	0.43			
	36-80	15-27	1.40-1.50	0.6-2.0	0.14-0.19	7.4-8.4	0-4	Low-------	0.43			
Tr---------------	0-15	27-35	1.15-1.25	0.6-2.0	0.19-0.22	5.6-7.3	0-2	Moderate	0.28	5	7	4-6
Trent	15-39	27-35	1.20-1.35	0.6-2.0	0.17-0.20	6.1-7.3	0-2	Moderate	0.32			
	39-46	25-33	1.25-1.40	0.6-2.0	0.17-0.20	6.1-7.3	0-2	Moderate	0.43			
	46-52	20-30	1.30-1.45	0.6-2.0	0.17-0.20	7.4-8.4	0-2	Moderate	0.43			
	52-80	20-30	1.30-1.45	0.6-2.0	0.17-0.20	6.6-8.4	2-4	Moderate	0.43			
W.												
Water												

Table 17.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
Wa:												
Wakonda---------	0-13	27-30	1.15-1.30	0.6-2.0	0.19-0.22	6.6-8.4	2-4	Moderate	0.28	5	4L	3-6
	13-38	20-33	1.20-1.35	0.6-2.0	0.14-0.17	7.4-8.4	2-4	Moderate	0.43			
	38-73	20-30	1.30-1.50	0.5-2.0	0.16-0.20	7.4-8.4	4-8	Moderate	0.43			
	73-80	25-34	1.50-1.70	0.2-0.6	0.16-0.20	7.4-8.4	2-4	Moderate	0.37			
Chancellor------	0-12	30-40	1.15-1.25	0.06-0.6	0.13-0.19	6.1-7.3	0-2	High------	0.37	5	7	4-6
	12-31	35-55	1.20-1.35	0.06-0.2	0.11-0.19	6.1-7.8	0-2	High------	0.28			
	31-80	25-40	1.35-1.50	0.06-0.6	0.14-0.20	7.4-8.4	2-4	High------	0.43			
WcA:												
Wentworth-------	0-10	27-35	1.15-1.25	0.6-2.0	0.19-0.22	5.6-7.3	0-2	Moderate	0.28	5	7	3-6
	10-26	25-35	1.20-1.35	0.6-2.0	0.18-0.21	6.1-7.3	0-2	Moderate	0.43			
	26-55	20-30	1.30-1.45	0.6-2.0	0.17-0.20	7.4-8.4	0-2	Moderate	0.43			
	55-80	25-35	1.50-1.70	0.2-0.6	0.16-0.20	7.4-8.4	2-4	Moderate	0.37			
Chancellor------	0-12	30-40	1.15-1.25	0.06-0.6	0.13-0.19	6.1-7.3	0-2	High------	0.37	5	7	4-6
	12-31	35-55	1.20-1.35	0.06-0.2	0.11-0.19	6.1-7.8	0-2	High------	0.28			
	31-80	25-40	1.35-1.50	0.06-0.6	0.14-0.20	7.4-8.4	2-4	High------	0.43			
Wakonda---------	0-13	27-30	1.15-1.30	0.6-2.0	0.19-0.22	6.6-8.4	2-4	Moderate	0.28	5	4L	3-6
	13-38	20-33	1.20-1.35	0.6-2.0	0.14-0.17	7.4-8.4	2-4	Moderate	0.43			
	38-73	20-30	1.30-1.50	0.6-2.0	0.16-0.20	7.4-8.4	4-8	Moderate	0.43			
	73-80	25-34	1.50-1.70	0.2-0.6	0.16-0.20	7.4-8.4	2-4	Moderate	0.37			
WhA, WhB:												
Wentworth-------	0-10	27-35	1.15-1.25	0.6-2.0	0.19-0.22	5.6-7.3	---	Moderate	0.28	5	7	3-6
	10-30	25-35	1.15-1.30	0.6-2.0	0.18-0.21	6.1-7.3	---	Moderate	0.43			
	30-80	20-30	1.25-1.40	0.6-2.0	0.17-0.20	7.4-8.4	2-4	Moderate	0.43			
Trent-----------	0-15	27-35	1.15-1.25	0.6-2.0	0.19-0.22	5.6-7.3	0-2	Moderate	0.28	5	7	4-6
	15-39	27-35	1.20-1.35	0.6-2.0	0.17-0.20	6.1-7.3	0-2	Moderate	0.32			
	39-46	25-33	1.25-1.40	0.6-2.0	0.17-0.20	6.1-7.3	0-2	Moderate	0.43			
	46-52	20-30	1.30-1.45	0.6-2.0	0.17-0.20	7.4-8.4	0-2	Moderate	0.43			
	52-80	20-30	1.30-1.45	0.6-2.0	0.17-0.20	6.6-8.4	2-4	Moderate	0.43			
Wk--------------- Whitewood	0-10	27-34	1.15-1.25	0.2-0.6	0.19-0.22	6.1-7.3	---	Moderate	0.28	5	7	4-6
	10-36	25-34	1.20-1.35	0.2-0.6	0.19-0.22	6.1-7.8	---	Moderate	0.28			
	36-50	25-34	1.20-1.35	0.2-0.6	0.17-0.20	6.6-8.4	0-2	Moderate	0.43			
	50-80	25-40	1.35-1.50	0.2-0.6	0.17-0.20	7.4-8.4	0-4	Moderate	0.43			
Wo--------------- Worthing	0-16	35-40	1.15-1.25	0.2-0.6	0.19-0.22	5.6-7.3	0-2	High------	0.37	5	4	3-5
	16-46	40-60	1.25-1.40	0.06-0.2	0.13-0.18	6.1-7.3	0-2	High------	0.28			
	46-80	30-50	1.35-1.50	0.2-0.6	0.11-0.17	6.6-8.4	2-8	High------	0.32			
Wr:												
Worthing--------	0-16	35-40	1.15-1.25	0.2-0.6	0.19-0.22	5.6-7.3	0-2	High------	0.37	5	4	3-5
	16-46	40-60	1.25-1.40	0.06-0.2	0.13-0.18	6.1-7.3	0-2	High------	0.28			
	46-80	30-50	1.35-1.50	0.2-0.6	0.11-0.17	6.6-8.4	2-8	High------	0.32			
Davison---------	0-8	27-30	1.20-1.35	0.6-2.0	0.19-0.22	6.6-8.4	0-2	Moderate	0.28	5	4L	2-6
	8-41	18-30	1.20-1.35	0.6-2.0	0.13-0.17	7.4-9.0	0-2	Moderate	0.37			
	41-80	18-30	1.25-1.35	0.6-2.0	0.16-0.20	7.4-8.4	2-4	Moderate	0.37			

Table 18.--Soil and Water Features

(See text for definitions of terms used in this table. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
AcA: Alcester	B	Rare	---	---	3.0-6.0	Apparent	Oct-Jun	>60	---	High	Moderate	Low.
AcB: Alcester	B	None	---	---	>6.0	---	---	>60	---	High	Moderate	Low.
Ar: Arlo	B	Occasional	Brief	Mar-Oct	0-1.5	Apparent	Oct-Jul	>60	---	High	High	Moderate.
Ba, Bb: Baltic	D	None	---	---	+2-1.5	Apparent	Jan-Dec	>60	---	High	High	Moderate.
BcA:												
Benclare	C	None	---	---	3.0-5.0	Apparent	Oct-Jun	>60	---	Moderate	High	Moderate.
Corson	C	None	---	---	>6.0	---	---	>60	---	Moderate	High	Low.
BeE:												
Betts	B	None	---	---	>6.0	---	---	>60	---	Moderate	High	Moderate.
Ethan	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
BfA: Blendon	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
BhB:												
Blendon	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
Henkin	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
Bo: Bon	B	Occasional	Brief	Apr-Oct	3.0-5.0	Apparent	Oct-Jul	>60	---	Moderate	Moderate	Low.
Cb: Chancellor	C	Frequent	Brief	Mar-Oct	0-2.0	Apparent	Mar-Jun	>60	---	High	High	Moderate.
Cc:												
Chancellor	C	Frequent	Brief	Mar-Oct	0-2.0	Apparent	Mar-Jun	>60	---	High	High	Moderate.
Tetonka	C/D	None	---	---	+1-1.0	Perched	Jan-Dec	>60	---	High	High	Moderate.

Table 18.--Soil and Water Features--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
Cd----------------- Chaska	B/D	Occasional	Brief-----	Mar-Jun	0.5-1.5	Apparent	Nov-Jun	>60	---	High-----	High-----	Low.
Ch----------------- Chaska	B/D	Frequent----	Long------	Mar-Jun	1.5-2.5	Apparent	Nov-Jun	>60	---	High-----	High-----	Low.
Cm----------------- Clamo	C/D	Occasional	Long------	Mar-Jun	0.5-1.5	Apparent	Oct-Jun	>60	---	High-----	High-----	High.
CoB, CoC---------- Corson	C	None---------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Low.
CpC:												
Corson-----------	C	None---------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Low.
Henkin-----------	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
CrD, CrE:												
Crofton----------	B	None---------	---	---	>6.0	---	---	>80	---	Moderate	Low------	Low.
Nora-------------	B	None---------	---	---	>6.0	---	---	>60	---	High-----	Moderate	Low.
CsD:												
Crofton----------	B	None---------	---	---	>6.0	---	---	>80	---	Moderate	Low------	Low.
Shindler---------	C	None---------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Moderate.
DcA---------------- Davis	B	Rare---------	---	---	3.0-5.0	Apparent	Mar-Jun	>60	---	Moderate	Moderate	Low.
DcB, DcC---------- Davis	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
Dd:												
Davison----------	B	None---------	---	---	1.5-4.0	Perched	Apr-Jun	>60	---	High-----	High-----	Moderate.
Crossplain-------	C	Frequent----	Brief-----	Mar-Oct	0-2.0	Perched	Mar-Jun	>60	---	High-----	High-----	Moderate.
DeA, DeB:												
Delmont----------	B	None---------	---	---	>6.0	---	---	>60	---	Low------	Moderate	Low.
Enet-------------	B	None---------	---	---	>6.0	---	---	>60	---	Low------	Moderate	Low.

Table 18.--Soil and Water Features--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
DgC, DgD:												
Delmont	B	None	---	---	>6.0	---	---	>60	---	Low	Moderate	Low.
Talmo	A	None	---	---	>6.0	---	---	>60	---	Low	Moderate	Low.
DmA, DmB Dempster	B	None	---	---	>6.0	---	---	>60	---	High	Moderate	Low.
DtB:												
Dempster	B	None	---	---	>6.0	---	---	>60	---	High	Moderate	Low.
Talmo	A	None	---	---	>6.0	---	---	>60	---	Low	Moderate	Low.
Dw Dimo	B	Occasional	Brief	Mar-Oct	1.5.3.0	Apparent	Mar-Jun	>60	---	High	High	Low.
DxB Dobalt	B	None	---	---	>6.0	---	---	>60	---	Moderate	High	Moderate.
DyA:												
Dobalt	B	None	---	---	>6.0	---	---	>60	---	Moderate	High	Moderate.
Bonilla	B	None	---	---	3.5-5.0	Perched	Mar-Jun	>60	---	Moderate	High	Moderate.
EaB:												
Egan	B	None	---	---	>6.0	---	---	>60	---	High	High	Moderate.
Ethan	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
EeB:												
Egan	B	None	---	---	>6.0	---	---	>60	---	High	High	Moderate.
Ethan	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
Trent	B	None	---	---	3.5-5.0	Perched	Mar-Jun	>60	---	High	Moderate	Low.
EfA:												
Egan	B	None	---	---	>6.0	---	---	>60	---	High	High	Moderate.
Trent	B	None	---	---	3.5-5.0	Perched	Mar-Jun	>60	---	High	Moderate	Low.
EgB:												
Egan	B	None	---	---	>6.0	---	---	>60	---	High	High	Moderate.
Wentworth	B	None	---	---	>6.0	---	---	>60	---	High	High	Low.

Table 18.--Soil and Water Features--Continued

Soil name and map symbol	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Bedrock: Depth	Bedrock: Hardness	Potential frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft			In				
EgB:												
Trent	B	None	---	---	3.5-5.0	Perched	Mar-Jun	>60	---	High	Moderate	Low.
EnA Enet	B	Rare	---	---	3.5-6.0	Apparent	Mar-Jun	>60	---	Low	Moderate	Low.
EoA:												
Enet	B	Rare	---	---	3.5-6.0	Apparent	Mar-Jun	>60	---	Low	Moderate	Low.
Dimo	B	Occasional	Brief	Mar-Oct	1.5-3.0	Apparent	Mar-Jun	>60	---	High	High	Low.
EpD:												
Ethan	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
Betts	B	None	---	---	>6.0	---	---	>60	---	Moderate	High	Moderate.
EsE:												
Ethan	B	None	---	---	>6.0	---	---	>60	---	Moderate	High	Moderate.
Clarno	B	None	---	---	>6.0	---	---	>60	---	Moderate	High	Moderate.
EtD:												
Ethan	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
Clarno	B	None	---	---	>6.0	---	---	>60	---	Moderate	High	Moderate.
EuC:												
Ethan	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
Egan	B	None	---	---	>6.0	---	---	>60	---	High	High	Moderate.
ExC:												
Ethan	B	None	---	---	>6.0	---	---	>60	---	Moderate	High	Moderate.
Egan	B	None	---	---	>6.0	---	---	>60	---	High	High	Moderate.
FaA, FaB Flandreau	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
FtB:												
Flandreau	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
Thurman	A	None	---	---	>6.0	---	---	>80	---	Low	Low	Low.
GrA Graceville	B	None	---	---	>6.0	---	---	>60	---	High	Moderate	Low.

Table 18.--Soil and Water Features--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
GsB-------------- Grovena	B	None--------	---	---	>6.0	---	---	>60	---	High-----	High-----	Moderate.
GvA:												
Grovena----------	B	None--------	---	---	>6.0	---	---	>60	---	High-----	High-----	Moderate.
Bonilla----------	B	None--------	---	---	3.5-5.0	Perched	Mar-Jun	>60	---	Moderate	High-----	Moderate.
HoB-------------- Houdek	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Moderate.
HsC, HsD:												
Houdek-----------	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Moderate.
Shindler---------	C	None--------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Moderate.
HtD:												
Houdek-----------	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Moderate.
Talmo------------	A	None--------	---	---	>6.0	---	---	>60	---	Low------	Moderate	Low.
HuA, HuB--------- Huntimer	C	None--------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Moderate.
IhA-------------- Ihlen	B	None--------	---	---	>6.0	---	---	20-40	Hard----	High-----	High-----	Low.
IrB, IrE:												
Ihlen------------	B	None--------	---	---	>6.0	---	---	20-40	Hard----	High-----	High-----	Low.
Rock outcrop-----	D	None--------	---	---	>6.0	---	---	0-1	Hard----	Low------	Moderate	Low.
Ja--------------- Janude	B	Rare--------	---	---	4.0-6.0	Apparent	Mar-Jun	>80	---	Moderate	Moderate	Low.
La--------------- Lamo	C	Occasional	Brief-----	Mar-Aug	1.0-3.0	Apparent	Nov-May	>80	---	High-----	High-----	Low.
Lb--------------- Lamo	C	Frequent----	Brief-----	Mar-Aug	1.0-3.0	Apparent	Nov-May	>80	---	High-----	High-----	Low.
M-W. Miscellaneous water												

Table 18.--Soil and Water Features--Continued

Soil name and map symbol	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Bedrock: Depth	Bedrock: Hardness	Potential frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft			In				
MdB-----------------Moody	B	None---------	---	---	>6.0	---	---	>60	---	High------	Moderate	Low.
MgA:												
Moody------------	B	None---------	---	---	>6.0	---	---	>60	---	High------	Moderate	Low.
Gayville----------	D	Rare---------	---	---	2.0-4.0	Apparent	Oct-Jun	>60	---	Moderate	High------	Moderate.
MnB, MnC:												
Moody------------	B	None---------	---	---	>6.0	---	---	>60	---	High------	Moderate	Low.
Nora-------------	B	None---------	---	---	>6.0	---	---	>60	---	High------	Moderate	Low.
MtA:												
Moody------------	B	None---------	---	---	>6.0	---	---	>60	---	High------	Moderate	Low.
Trent------------	B	None---------	---	---	3.5-5.0	Perched	Mar-Jun	>60	---	High------	Moderate	Low.
NcC:												
Nora-------------	B	None---------	---	---	>6.0	---	---	>60	---	High------	Moderate	Low.
Crofton----------	B	None---------	---	---	>6.0	---	---	>80	---	Moderate	Low-------	Low.
Ob-----------------Obert	D	Frequent-----	Very brief or brief.	Mar-Oct	+.5-1.0	Apparent	Nov-Jun	>80	---	High------	High------	Low.
Og-----------------Orthents	A	None---------	---	---	>6.0	---	---	>60	---	Low-------	Moderate	Low.
Or-----------------Orthents	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
Ow:												
Orthents----------	A	None---------	---	---	>6.0	---	---	>60	---	Low-------	Moderate	Low.
Aquents----------	A	None---------	---	---	+2-2.0	Apparent	Jan-Dec	>60	---	Moderate	High------	Low.
Pt-----------------Pits, quarry	D	None---------	---	---	>6.0	---	---	0-1	Hard-----	Low-------	Moderate	Low.
Sa-----------------Salmo	C/D	Frequent-----	Brief------	Mar-Jun	0-1.5	Apparent	Sep-Jun	>60	---	High------	High------	High.

Table 18.--Soil and Water Features--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
SdE:												
Shindler	C	None	---	---	>6.0	---	---	>60	---	Moderate	High	Moderate.
Houdek	B	None	---	---	>6.0	---	---	>60	---	Moderate	High	Moderate.
SnE:												
Shindler	C	None	---	---	>6.0	---	---	>60	---	Moderate	High	Moderate.
Talmo	A	None	---	---	>6.0	---	---	>60	---	Low	Moderate	Low.
SpA, SpB Splitrock	B	None	---	---	>6.0	---	---	>80	---	High	High	Moderate.
SsF:												
Steinauer	B	None	---	---	>6.0	---	---	>80	---	Moderate	High	Low.
Shindler	C	None	---	---	>6.0	---	---	>60	---	Moderate	High	Moderate.
TdE:												
Talmo	A	None	---	---	>6.0	---	---	>60	---	Low	Moderate	Low.
Delmont	B	None	---	---	>6.0	---	---	>60	---	Low	Moderate	Low.
Te Tetonka	C/D	None	---	---	+1-1.0	Perched	Jan-Dec	>60	---	High	High	Moderate.
TfC:												
Thurman	A	None	---	---	>6.0	---	---	>80	---	Low	Low	Low.
Flandreau	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
TgD:												
Thurman	A	None	---	---	>6.0	---	---	>80	---	Low	Low	Low.
Grovena	B	None	---	---	>6.0	---	---	>60	---	High	High	Moderate.
Tr Trent	B	None	---	---	3.5-5.0	Perched	Mar-Jun	>60	---	High	Moderate	Low.
W. Water												
Wa:												
Wakonda	B	None	---	---	2.0-4.0	Perched	Mar-Jun	>60	---	High	High	Moderate.
Chancellor	C	Frequent	Brief	Mar-Oct	0-2.0	Apparent	Mar-Jun	>60	---	High	High	Moderate.

Table 18.--Soil and Water Features--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
WcA:												
Wentworth--------	B	None--------	---	---	3.0-5.0	Perched	Mar-Jul	>60	---	High-----	High-----	Moderate.
Chancellor-------	C	Frequent----	Brief-----	Mar-Oct	0-2.0	Apparent	Mar-Jun	>60	---	High-----	High-----	Moderate.
Wakonda----------	B	None--------	---	---	2.0-4.0	Perched	Mar-Jun	>60	---	High-----	High-----	Moderate.
WhA, WhB:												
Wentworth--------	B	None--------	---	---	>6.0	---	---	>60	---	High-----	High-----	Low.
Trent------------	B	None--------	---	---	3.5-5.0	Perched	Mar-Jun	>60	---	High-----	Moderate	Low.
Wk---------------- Whitewood	C/D	Frequent----	Very brief	Mar-Oct	0-2.0	Apparent	Sep-Jun	>60	---	High-----	High-----	Low.
Wo---------------- Worthing	D	None--------	---	---	+2-1.0	Perched	Jan-Dec	>60	---	High-----	High-----	Moderate.
Wr:												
Worthing---------	D	None--------	---	---	+2-1.0	Perched	Jan-Dec	>60	---	High-----	High-----	Moderate.
Davison----------	B	None--------	---	---	1.5-4.0	Perched	Apr-Jun	>60	---	High-----	High-----	Moderate.

Table 19.--Classification of the Soils

Soil name	Family or higher taxonomic class
Alcester	Fine-silty, mixed, superactive, mesic Cumulic Haplustolls
Aquents	Aquents
Arlo	Fine-loamy over sandy or sandy-skeletal, superactive, mesic Typic Calciaquolls
Baltic	Fine, smectitic, calcareous, mesic Cumulic Vertic Endoaquolls
Benclare	Fine, smectitic, mesic Udertic Haplustolls
Betts	Fine-loamy, mixed, superactive, mesic Typic Calciustepts
Blendon	Coarse-loamy, mixed, superactive, mesic Pachic Haplustolls
Bon	Fine-loamy, mixed, superactive, mesic Cumulic Haplustolls
Bonilla	Fine-loamy, mixed, superactive, mesic Pachic Haplustolls
Chancellor	Fine, smectitic, mesic Vertic Argiaquolls
Chaska	Fine-loamy, mixed, superactive, calcareous, mesic Aeric Fluvaquents
Clamo	Fine, smectitic, mesic Cumulic Vertic Endoaquolls
Clarno	Fine-loamy, mixed, superactive, mesic Typic Haplustolls
Corson	Fine, smectitic, mesic Udertic Haplustolls
Crofton	Fine-silty, mixed, superactive, calcareous, mesic Typic Ustorthents
Crossplain	Fine, smectitic, mesic Typic Argiaquolls
Davis	Fine-loamy, mixed, superactive, mesic Pachic Haplustolls
Davison	Fine-loamy, mixed, superactive, mesic Aquic Calciustolls
Delmont	Fine-loamy over sandy or sandy-skeletal, mixed, superactive, mesic Typic Haplustolls
Dempster	Fine-silty over sandy or sandy-skeletal, mixed, superactive, mesic Udic Haplustolls
Dimo	Fine-loamy over sandy or sandy-skeletal, mixed, superactive, mesic Pachic Haplustolls
Dobalt	Fine-loamy, mixed, superactive, mesic Udic Haplustolls
Egan	Fine-silty, mixed, superactive, mesic Udic Haplustolls
Enet	Fine-loamy over sandy or sandy-skeletal, mixed, superactive, mesic Pachic Haplustolls
Ethan	Fine-loamy, mixed, superactive, mesic Typic Calciustolls
Flandreau	Fine-loamy, mixed, superactive, mesic Udic Haplustolls
Gayville	Fine, smectitic, mesic Leptic Natrustolls
Graceville	Fine-silty, mixed, superactive, mesic Pachic Haplustolls
Grovena	Fine-loamy, mixed, superactive, mesic Udic Haplustolls
Henkin	Coarse-loamy, mixed, superactive, mesic Udic Haplustolls
Houdek	Fine-loamy, mixed, superactive, mesic Typic Argiustolls
Huntimer	Fine, smectitic, mesic Udertic Haplustolls
Ihlen	Fine-silty, mixed, superactive, mesic Udic Haplustolls
Janude	Coarse-loamy, mixed, superactive, mesic Cumulic Haplustolls
Lamo	Fine-silty, mixed, superactive, calcareous, mesic Cumulic Endoaquolls
Moody	Fine-silty, mixed, superactive, mesic Udic Haplustolls
Nora	Fine-silty, mixed, superactive, mesic Udic Haplustolls
Obert	Fine-silty, mixed, superactive, calcareous, mesic Cumulic Endoaquolls
Orthents	Mesic Orthents
Salmo	Fine-silty, mixed, superactive, calcareous, mesic Cumulic Endoaquolls
Shindler	Fine-loamy, mixed, superactive, mesic Udorthentic Haplustolls
Splitrock	Fine-silty, mixed, superactive, mesic Oxyaquic Haplustolls
Steinauer	Fine-loamy, mixed, superactive, calcareous, mesic Typic Udorthents
Talmo	Sandy-skeletal, mixed, mesic Udorthentic Haplustolls
Tetonka	Fine, smectitic, mesic Argiaquic Argialbolls
Thurman	Sandy, mixed, mesic Udorthentic Haplustolls
Trent	Fine-silty, mixed, superactive, mesic Pachic Haplustolls
Wakonda	Fine-silty, mixed, superactive, mesic Aeric Calciaquolls
Wentworth	Fine-silty, mixed, superactive, mesic Udic Haplustolls
Whitewood	Fine-silty, mixed, superactive, mesic Cumulic Endoaquolls
Worthing	Fine, smectitic, mesic Vertic Argiaquolls

Interpretive Groups

Interpretive Groups

(Absence of an entry indicates that the soil is not assigned to the interpretive group)

Map symbol	Soil name	Land capability classification	Range site	Windbreak suitability group	Pasture suitability group
AcA	Alcester----------	1	Loamy Overflow-----	1	K
AcB	Alcester----------	2e	Silty-------------	3	F
Ar	Arlo--------------	4w	Subirrigated-------	10	A
Ba	Baltic------------	5w	Shallow Marsh------	10	B2
Bb	Baltic------------	8w	---	10	NS
BcA	Benclare----------	1	Loamy Overflow-----	4	K
	Corson------------	2s	Clayey------------	4C	E
BeE	Betts-------------	7e	Thin Upland--------	10	NS
	Ethan-------------	7e	Thin Upland--------	10	NS
BfA	Blendon-----------	2s	Sandy-------------	5	H
BhB	Blendon-----------	3e	Sandy-------------	5	H
	Henkin------------	3e	Sandy-------------	5	H
Bo	Bon---------------	1	Loamy Overflow-----	1	K
Cb	Chancellor--------	2w	Loamy Overflow-----	2	A
Cc	Chancellor--------	2w	Loamy Overflow-----	2	A
	Tetonka-----------	4w	Wet Meadow---------	10	B2
Cd	Chaska------------	2w	Subirrigated-------	1K	A
Ch	Chaska------------	6w	Subirrigated-------	1K	NS
Cm	Clamo-------------	4w	Wetland------------	10	B1
CoB	Corson------------	3e	Clayey------------	4C	E
CoC	Corson------------	3e	Clayey------------	4C	E
CpC	Corson------------	3e	Clayey------------	4C	E
	Henkin------------	4e	Sandy-------------	5	H
CrD	Crofton-----------	6e	Thin Upland--------	8	G
	Nora--------------	4e	Silty-------------	3	F
CrE	Crofton-----------	6e	Thin Upland--------	10	NS
	Nora--------------	6e	Silty-------------	10	NS
CsD	Crofton-----------	6e	Thin Upland--------	8	G
	Shindler----------	6e	Silty-------------	8	G
DcA	Davis-------------	1	Loamy Overflow-----	1	K
DcB	Davis-------------	2e	Silty-------------	3	F

Interpretive Groups--Continued

Map symbol	Soil name	Land capability classification	Range site	Windbreak suitability group	Pasture suitability group
DcC	Davis------------	3e	Silty-------------	3	F
Dd	Davison----------	2s	Limy Subirrigated--	1K	F
	Crossplain--------	2w	Loamy Overflow-----	2	A
DeA	Delmont----------	3s	Shallow to Gravel--	6G	D2
	Enet-------------	2s	Silty-------------	6G	D1
DeB	Delmont----------	4e	Shallow to Gravel--	6G	D2
	Enet-------------	3e	Silty-------------	6G	D1
DgC	Delmont----------	4e	Shallow to Gravel--	6G	D2
	Talmo------------	6s	Very Shallow-------	10	NS
DgD	Delmont----------	6e	Shallow to Gravel--	10	NS
	Talmo------------	6e	Very Shallow-------	10	NS
DmA	Dempster---------	2s	Silty-------------	6G	D1
DmB	Dempster---------	3e	Silty-------------	6G	D1
DtB	Dempster---------	3e	Silty-------------	6G	D1
	Talmo------------	6s	Very Shallow-------	10	NS
Dw	Dimo-------------	2w	Loamy Overflow-----	1	K
DxB	Dobalt-----------	2e	Silty-------------	3	F
DyA	Dobalt-----------	1	Silty-------------	3	F
	Bonilla----------	1	Loamy Overflow-----	1	K
EaB	Egan-------------	2e	Silty-------------	3	F
	Ethan------------	3e	Thin Upland--------	8	G
EeB	Egan-------------	2e	Silty-------------	3	F
	Ethan------------	3e	Thin Upland--------	8	G
	Trent------------	1	Loamy Overflow-----	1	K
EfA	Egan-------------	1	Silty-------------	3	F
	Trent------------	1	Loamy Overflow-----	1	K
EgB	Egan-------------	2e	Silty-------------	3	F
	Wentworth---------	2e	Silty-------------	3	F
	Trent------------	1	Loamy Overflow-----	1	K
EnA	Enet-------------	2s	Silty-------------	6G	D1
EoA	Enet-------------	2e	Silty-------------	6G	D1
	Dimo-------------	2w	Loamy Overflow-----	1	K

Interpretive Groups--Continued

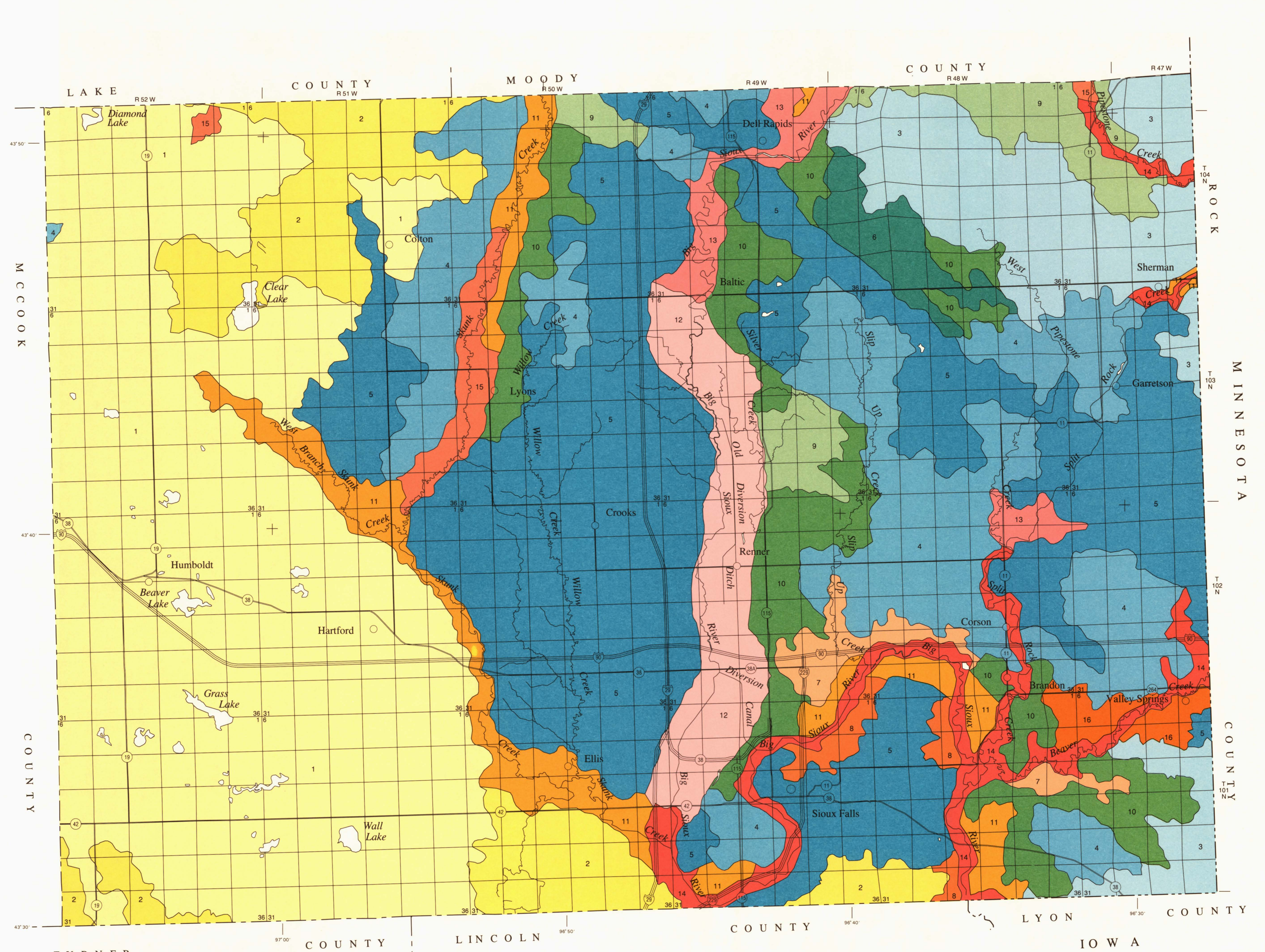
Map symbol	Soil name	Land capability classification	Range site	Windbreak suitability group	Pasture suitability group
EpD	Ethan	6e	Thin Upland	8	G
	Betts	6e	Thin Upland	8	G
EsE	Ethan	7s	Thin Upland	10	NS
	Clarno	7s	Silty	10	NS
EtD	Ethan	6e	Thin Upland	8	G
	Clarno	4e	Silty	3	F
EuC	Ethan	4e	Thin Upland	8	G
	Egan	3e	Silty	3	F
ExC	Ethan	7s	Thin Upland	10	NS
	Egan	3e	Silty	3	F
FaA	Flandreau	2s	Silty	3	F
FaB	Flandreau	2e	Silty	3	F
FtB	Flandreau	2e	Silty	3	F
	Thurman	4e	Sandy	5	H
GrA	Graceville	1	Silty	3	F
GsB	Grovena	2e	Silty	3	F
GvA	Grovena	1	Silty	3	F
	Bonilla	1	Loamy Overflow	1	K
HoB	Houdek	2e	Silty	3	F
HsC	Houdek	3e	Silty	3	F
	Shindler	4e	Silty	8	G
HsD	Houdek	4e	Silty	3	F
	Shindler	6e	Silty	8	G
HtD	Houdek	4e	Silty	3	F
	Talmo	6e	Very Shallow	10	NS
HuA	Huntimer	1	Silty	3	F
HuB	Huntimer	2e	Silty	3	F
IhA	Ihlen	2s	Silty	6D	F
IrB	Ihlen	2e	Silty	6D	F
	Rock outcrop	8s	---	10	NS
IrE	Ihlen	4e	Silty	6D	F
	Rock outcrop	8s	---	10	NS

Interpretive Groups--Continued

Map symbol	Soil name	Land capability classification	Range site	Windbreak suitability group	Pasture suitability group
Ja	Janude	2s	Sandy	1	H
La	Lamo	2w	Subirrigated	2K	A
Lb	Lamo	6w	Subirrigated	2K	NS
MdB	Moody	2e	Silty	3	F
MgA	Moody	1	Silty	3	F
	Gayville	6s	Saline Lowland	9W	J
MnB	Moody	2e	Silty	3	F
	Nora	2e	Silty	3	F
MnC	Moody	3e	Silty	3	F
	Nora	3e	Silty	3	F
MtA	Moody	1	Silty	3	F
	Trent	1	Loamy Overflow	1	K
NcC	Nora	3e	Silty	3	F
	Crofton	4e	Thin Upland	8	G
Ob	Obert	5w	Wetland	10	B1
Og	Orthents	8s	Very Shallow	10	NS
Or	Orthents	4e	Thin Upland	8	G
Ow	Orthents	8s	Very Shallow	10	NS
	Aquents	5w	Wetland	10	NS
Pt	Pits, quarry	8s	---	10	NS
Sa	Salmo	4w	Saline Subirrigated	10	J
SdE	Shindler	7e	Silty	10	NS
	Houdek	6e	Silty	10	NS
SnE	Shindler	7e	Silty	10	NS
	Talmo	7e	Very Shallow	10	NS
SpA	Splitrock	1	Silty	3	F
SpB	Splitrock	2e	Silty	3	F
SsF	Steinauer	7e	Thin Upland	10	NS
	Shindler	7e	Silty	10	NS
TdE	Talmo	7e	Very Shallow	10	NS
	Delmont	6e	Shallow to Gravel	10	NS
Te	Tetonka	4w	Wet Meadow	10	B2

Interpretive Groups--Continued

Map symbol	Soil name	Land capability classification	Range site	Windbreak suitability group	Pasture suitability group
TfC	Thurman-----------	4e	Sandy--------------	5	H
	Flandreau---------	3e	Silty--------------	3	F
TgD	Thurman-----------	6e	Sandy--------------	5	H
	Grovena-----------	4e	Silty--------------	3	F
Tr	Trent-------------	1	Loamy Overflow-----	1	K
Wa	Wakonda-----------	2s	Limy Subirrigated--	1K	F
	Chancellor--------	2w	Loamy Overflow-----	2	A
WcA	Wentworth---------	1	Silty--------------	3	F
	Chancellor--------	2w	Loamy Overflow-----	2	A
	Wakonda-----------	2s	Limy Subirrigated--	1K	F
WhA	Wentworth---------	1	Silty--------------	3	F
	Trent-------------	1	Loamy Overflow-----	1	K
WhB	Wentworth---------	2e	Silty--------------	3	F
	Trent-------------	1	Loamy Overflow-----	1	K
Wk	Whitewood---------	2w	Loamy Overflow-----	2	A
Wo	Worthing----------	5w	Shallow Marsh------	10	B2
Wr	Worthing----------	5w	Shallow Marsh------	10	B2
	Davison-----------	2s	Limy Subirrigated--	1K	F



SOIL LEGEND*

1	Egan-Ethan-Trent association
2	Egan-Wentworth-Trent association
3	Moody-Trent association
4	Moody-Nora association
5	Nora-Crofton association
6	Splitrock-Trent association
7	Houdek-Shindler association
8	Shindler-Steinauer association
9	Grovena-Dobalt-Flandreau association
10	Flandreau-Thurman-Grovena association
11	Dempster-Graceville association
12	Clamo-Chaska association
13	Bon-Davis-Chaska association
14	Chaska-Davis-Bon association
15	Lamo-Graceville association
16	Corson-Benclare association

*The units on this legend are described in the text under the heading "General Soil Map Units."

Compiled 2001

SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
in cooperation with

SOUTH DAKOTA AGRICULTURAL EXPERIMENT STATION

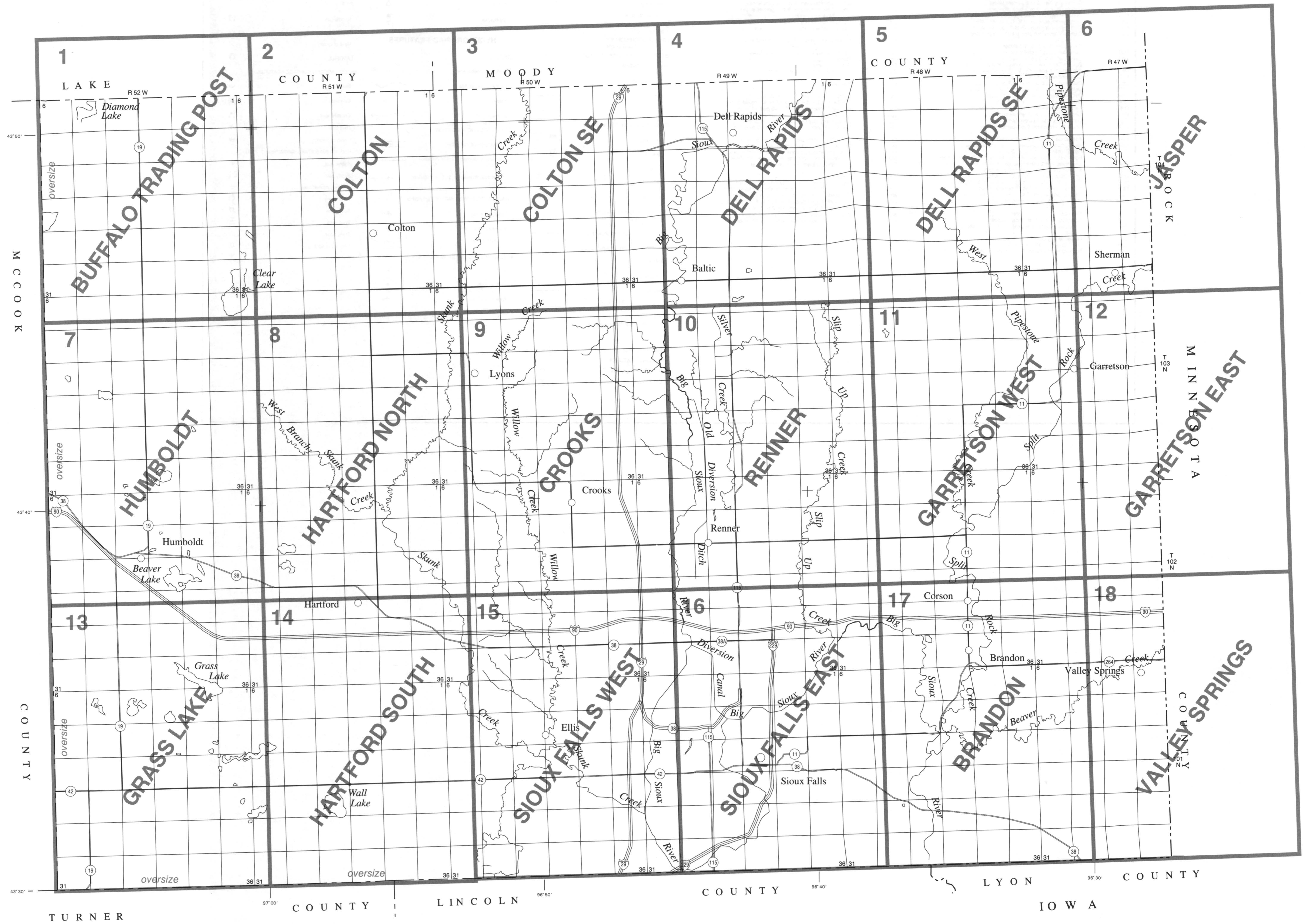
GENERAL SOIL MAP
MINNEHAHA COUNTY, SOUTH DAKOTA

Scale 1:125000

MILES

KILOMETERS

Each area outlined on this map consists of more than one kind of soil. The map is meant for general planning rather than a basis for decisions on the use of specific tracts.



SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

INDEX TO MAP SHEETS
MINNEHAHA COUNTY, SOUTH DAKOTA

Scale 1:125000

MILES

KILOMETERS

SOIL LEGEND

Map symbols consist of a combination of letters. The first letter is the initial letter of the map unit name. The lowercase letter that follows separates map units having names that begin with the same letter, except that it does not separate slope phases. The second uppercase letter indicates the slope class. Symbols without a letter for slope class are for nearly level soils, for miscellaneous areas, or for soils that are classified at a level higher than the series level, such as Aquents.

SYMBOL	NAME
AcA	Alcester silty clay loam, 0 to 2 percent slopes
AcB	Alcester silty clay loam, 2 to 6 percent slopes
Ar	Arlo loam, 0 to 1 percent slopes
Ba	Baltic silty clay loam, 0 to 1 percent slopes
Bb	Baltic silty clay loam, ponded
BcA	Benclare-Corson complex, 0 to 2 percent slopes
BeE	Betts-Ethan loams, 15 to 40 percent slopes
BfA	Blendon fine sandy loam, 0 to 2 percent slopes
BhB	Blendon-Henkin fine sandy loams, 2 to 6 percent slopes
Bo	Bon loam, 0 to 2 percent slopes
Cb	Chancellor silty clay loam, 0 to 1 percent slopes
Cc	Chancellor-Tetonka complex, 0 to 1 percent slopes
Cd	Chaska loam, 0 to 2 percent slopes
Ch	Chaska loam, channeled
Cm	Clamo silty clay, 0 to 1 percent slopes
CoB	Corson silty clay, 2 to 6 percent slopes
CoC	Corson silty clay, 6 to 9 percent slopes
CpC	Corson-Henkin complex, 6 to 9 percent slopes
CrD	Crofton-Nora complex, 9 to 15 percent slopes
CrE	Crofton-Nora complex, 15 to 25 percent slopes
CsD	Crofton-Shindler complex, 9 to 15 percent slopes
DcA	Davis loam, 0 to 2 percent slopes
DcB	Davis loam, 2 to 6 percent slopes
DcC	Davis loam, 6 to 9 percent slopes
Dd	Davison-Crossplain clay loams, 0 to 2 percent slopes
DeA	Delmont-Enet loams, 0 to 2 percent slopes
DeB	Delmont-Enet loams, 2 to 6 percent slopes
DgC	Delmont-Talmo complex, 6 to 9 percent slopes
DgD	Delmont-Talmo complex, 9 to 15 percent slopes
DmA	Dempster silt loam, 0 to 2 percent slopes
DmB	Dempster silt loam, 2 to 6 percent slopes
DtB	Dempster-Talmo complex, 2 to 6 percent slopes
Dw	Dimo clay loam, 0 to 2 percent slopes
DxB	Dobalt loam, 2 to 6 percent slopes
DyA	Dobalt-Bonilla loams, 0 to 2 percent slopes
EaB	Egan-Ethan complex, 2 to 6 percent slopes
EeB	Egan-Ethan-Trent complex, 1 to 6 percent slopes
EfA	Egan-Trent silty clay loams, 0 to 2 percent slopes
EgB	Egan-Wentworth-Trent silty clay loams, 1 to 6 percent slopes
EnA	Enet loam, 0 to 2 percent slopes, rarely flooded
EoA	Enet-Dimo complex, 0 to 2 percent slopes
EpD	Ethan-Betts loams, 9 to 15 percent slopes
EsE	Ethan-Clarno loams, 6 to 25 percent slopes, very stony
EtD	Ethan-Clarno loams, 9 to 15 percent slopes
EuC	Ethan-Egan complex, 6 to 9 percent slopes
ExC	Ethan, very stony-Egan complex, 2 to 9 percent slopes
FaA	Flandreau loam, 0 to 2 percent slopes
FaB	Flandreau loam, 2 to 6 percent slopes
FtB	Flandreau-Thurman complex, 2 to 6 percent slopes
GrA	Graceville silty clay loam, 0 to 2 percent slopes
GsB	Grovena loam, 2 to 6 percent slopes
GvA	Grovena-Bonilla loams, 0 to 2 percent slopes

SYMBOL	NAME
HoB	Houdek clay loam, 2 to 6 percent slopes
HsC	Houdek-Shindler clay loams, 6 to 9 percent slopes
HsD	Houdek-Shindler clay loams, 9 to 15 percent slopes
HtD	Houdek-Talmo complex, 9 to 15 percent slopes
HuA	Huntimer silty clay loam, 0 to 2 percent slopes
HuB	Huntimer silty clay loam, 2 to 6 percent slopes
IhA	Ihlen silty clay loam, 0 to 2 percent slopes
IrB	Ihlen-Rock outcrop complex, 0 to 4 percent slopes
IrE	Ihlen-Rock outcrop complex, 4 to 35 percent slopes
Ja	Janude fine sandy loam, 0 to 2 percent slopes
La	Lamo silty clay loam, 0 to 1 percent slopes
Lb	Lamo silty clay loam, channeled
M-W	Miscellaneous water
MdB	Moody silty clay loam, 2 to 6 percent slopes
MgA	Moody-Gayville complex, 0 to 3 percent slopes
MnB	Moody-Nora silty clay loams, 2 to 6 percent slopes
MnC	Moody-Nora silty clay loams, 6 to 9 percent slopes
MtA	Moody-Trent silty clay loams, 0 to 2 percent slopes
NcC	Nora-Crofton complex, 6 to 9 percent slopes
Ob	Obert silty clay loam, 0 to 1 percent slopes
Og	Orthents, gravelly
Or	Orthents, loamy
Ow	Orthents-Aquents complex, gravelly
Pt	Pits, quarry
Sa	Salmo silty clay loam, 0 to 1 percent slopes
SdE	Shindler-Houdek clay loams, 15 to 40 percent slopes
SnE	Shindler-Talmo complex, 15 to 40 percent slopes
SpA	Splitrock silty clay loam, 0 to 2 percent slopes
SpB	Splitrock silty clay loam, 2 to 6 percent slopes
SsF	Steinauer-Shindler clay loams, 25 to 60 percent slopes
TdE	Talmo-Delmont complex, 15 to 40 percent slopes
Te	Tetonka silt loam, 0 to 1 percent slopes
TfC	Thurman-Flandreau complex, 6 to 9 percent slopes
TgD	Thurman-Grovena complex, 9 to 15 percent slopes
Tr	Trent silty clay loam, 0 to 2 percent slopes
W	Water
Wa	Wakonda-Chancellor silty clay loams, 0 to 2 percent slopes
WcA	Wentworth-Chancellor-Wakonda silty clay loams, 0 to 2 percent slopes
WhA	Wentworth-Trent silty clay loams, 0 to 2 percent slopes
WhB	Wentworth-Trent silty clay loams, 1 to 6 percent slopes
Wk	Whitewood silty clay loam, 0 to 2 percent slopes
Wo	Worthing silty clay loam, 0 to 1 percent slopes
Wr	Worthing-Davison complex, 0 to 2 percent slopes

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- National, state, or province
- County or parish
- Minor civil division
- Reservation (national forest or park, state forest or park)
- Land grant
- Limit of soil survey (lable) and/or denied access area
- Field sheet matchline & neatline
- Previously Published Survey

OTHER BOUNDARY (label)

- Airport, airfield
- Cemetery
- City/county park

STATE COORDINATE TICK
1 890 000 FEET

LAND DIVISION CORNER (section and land grants)

GEOGRAPHIC COORDINATE TICK

TRANSPORTATION

- Divided roads
- Other roads
- Trail

ROAD EMBLEM & DESIGNATIONS

- Interstate — 173, 79 345
- Federal — 287, 410 224
- State — 52, 52 347
- County, farm or ranch — 1283

RAILROAD

POWER TRANSMISSION LINE (normally not shown)

PIPE LINE (normally not shown)

FENCE (normally not shown)

LEVEES

- Without road
- With road
- With railroad
- Single side slope (showing actual feature location)

DAMS

- Medium or Small

LANDFORM FEATURES

- Prominent hill or peak
- Soil Sample Site

MISCELLANEOUS CULTURAL FEATURES

- Farmstead, house (omit in urban areas)
- Church
- School
- Other Religion (label) — Mt Cormel
- Located object (label) — Ranger Station
- Tank (label) — Petroleum
- Lookout Tower
- Oil and/or Natural Gas Wells
- Windmill
- Lighthouse

HYDROGRAPHIC FEATURES

STREAMS

- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end

DRAINAGE AND IRRIGATION

- Double-line canal (label) — CANAL
- Perennial drainage and/or irrigation ditch
- Intermittent drainage and/ or irrigation ditch

SMALL LAKES, PONDS AND RESERVOIRS

- Perennial water
- Miscellaneous water
- Flood pool line — FLOOD POOL LINE

MISCELLANEOUS WATER FEATURES

- Spring
- Well, artesian
- Well, irrigation

SPECIAL SYMBOLS FOR SOIL SURVEY AND SSURGO

SOIL DELINEATIONS AND SYMBOLS — DoB EkB

LANDFORM FEATURES

ESCARPMENTS

- Bedrock
- Other than bedrock

SHORT STEEP SLOPE

GULLY

DEPRESSION, closed

SINKHOLE

EXCAVATIONS

PITS

- Borrow pits
- Gravel pit
- Mine or quarry

LANDFILL

MISCELLANEOUS SURFACE FEATURES

- Blowout
- Clay spot
- Gravelly spot
- Lava flow
- Marsh or swamp
- Rock outcrop (includes sandstone and shale)
- Saline spot
- Sandy spot
- Severely eroded spot
- Slide or slip
- Sodic spot
- Spoil area
- Stony spot
- Very stony spot
- Wet spot

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

MINNEHAHA COUNTY, SOUTH DAKOTA
BUFFALO TRADING POST (OVERSIZE) QUADRANGLE
SHEET NUMBER 1 OF 18

This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey, from 1984 aerial photography. Hydrography and culture information were acquired from U.S. Geological Survey data; therefore, some features may not align exactly with base imagery.

North American Datum of 1927 (NAD27). Clarke 1866 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

NORTH

SCALE 1:24000

KILOMETERS

FEET

MILES

MINNEHAHA COUNTY, SOUTH DAKOTA NO. 1

QUADRANGLE LOCATION

BUFFALO TRADING POST (OVERSIZE), SOUTH DAKOTA
7.5 MINUTE SERIES
SHEET NUMBER 1 OF 18

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

MINNEHAHA COUNTY, SOUTH DAKOTA
COLTON QUADRANGLE
SHEET NUMBER 2 OF 18

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NORTH

SCALE 1:24000

KILOMETERS

FEET

MILES

MINNEHAHA COUNTY, SOUTH DAKOTA NO. 2

QUADRANGLE LOCATION

COLTON, SOUTH DAKOTA
7.5 MINUTE SERIES
SHEET NUMBER 2 OF 18

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NORTH

SCALE 1:24000

KILOMETERS

FEET

MILES

COLTON SE, SOUTH DAKOTA
7.5 MINUTE SERIES
SHEET NUMBER 3 OF 18

QUADRANGLE LOCATION

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

MINNEHAHA COUNTY, SOUTH DAKOTA
DELL RAPIDS QUADRANGLE
SHEET NUMBER 4 OF 18

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NORTH

SCALE 1:24000

KILOMETERS

FEET

MILES

QUADRANGLE LOCATION

DELL RAPIDS, SOUTH DAKOTA
7.5 MINUTE SERIES
SHEET NUMBER 4 OF 18

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

MINNEHAHA COUNTY, SOUTH DAKOTA
DELL RAPIDS SE QUADRANGLE
SHEET NUMBER 5 OF 18

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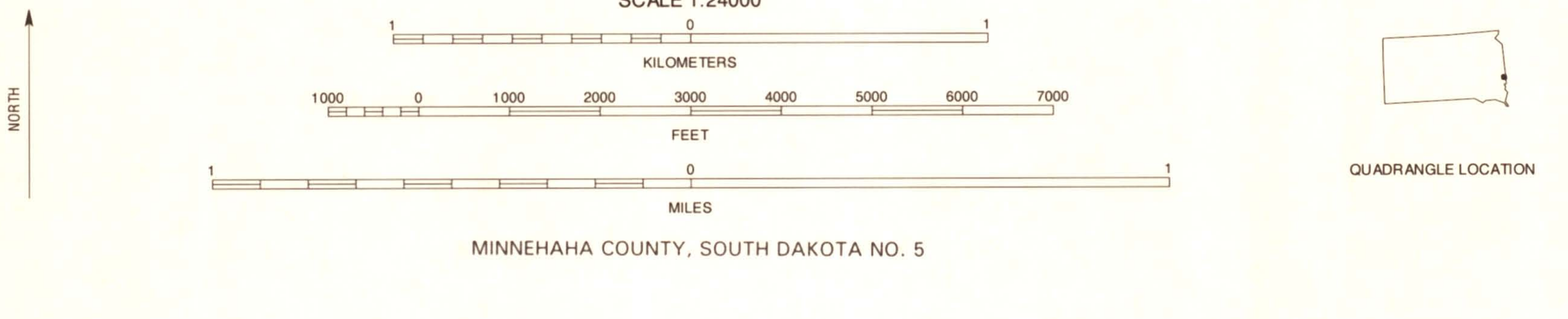

MINNEHAHA COUNTY, SOUTH DAKOTA NO. 5

DELL RAPIDS SE, SOUTH DAKOTA
7.5 MINUTE SERIES
SHEET NUMBER 5 OF 18

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NORTH

SCALE 1:24000

KILOMETERS

FEET

MILES

QUADRANGLE LOCATION

JASPER, SOUTH DAKOTA
7.5 MINUTE SERIES
SHEET NUMBER 6 OF 18

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

MINNEHAHA COUNTY, SOUTH DAKOTA
HUMBOLDT (OVERSIZE) QUADRANGLE
SHEET NUMBER 7 OF 18

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NORTH

SCALE 1:24000

KILOMETERS

FEET

MILES

MINNEHAHA COUNTY, SOUTH DAKOTA NO. 7

HUMBOLDT (OVERSIZE), SOUTH DAKOTA
7.5 MINUTE SERIES
SHEET NUMBER 7 OF 18

QUADRANGLE LOCATION

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

MINNEHAHA COUNTY, SOUTH DAKOTA
HARTFORD NORTH QUADRANGLE
SHEET NUMBER 8 OF 18

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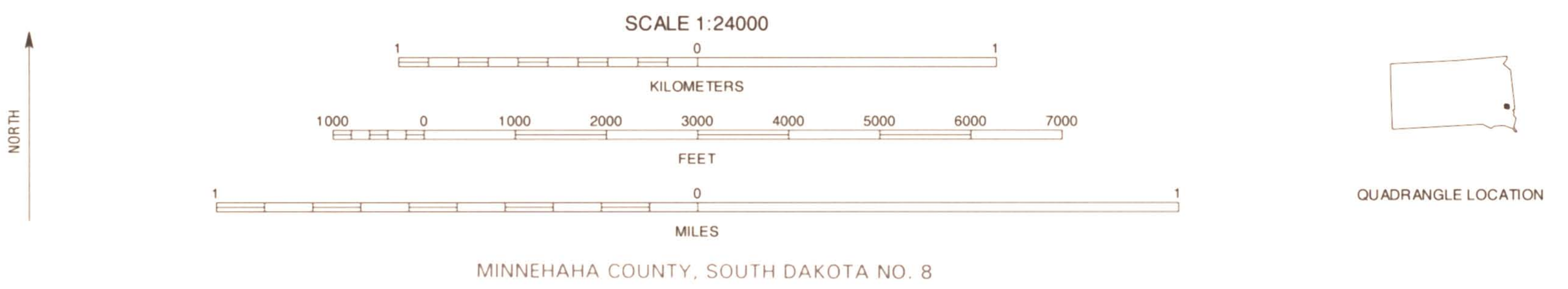

HARTFORD NORTH, SOUTH DAKOTA
7.5 MINUTE SERIES
SHEET NUMBER 8 OF 18

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

MINNEHAHA COUNTY, SOUTH DAKOTA
CROOKS QUADRANGLE
SHEET NUMBER 9 OF 18

Joins sheet 2, Colton

Joins sheet 4, Dell Rapids

Joins sheet 14, Hartford South (oversize)

Joins sheet 16, Sioux Falls East

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NORTH

SCALE 1:24000

KILOMETERS

FEET

MILES

QUADRANGLE LOCATION

CROOKS, SOUTH DAKOTA
7.5 MINUTE SERIES
SHEET NUMBER 9 OF 18

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

MINNEHAHA COUNTY, SOUTH DAKOTA
RENNER QUADRANGLE
SHEET NUMBER 10 OF 18

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1000-meter ticks: Universal Transverse Mercator, zone 14.
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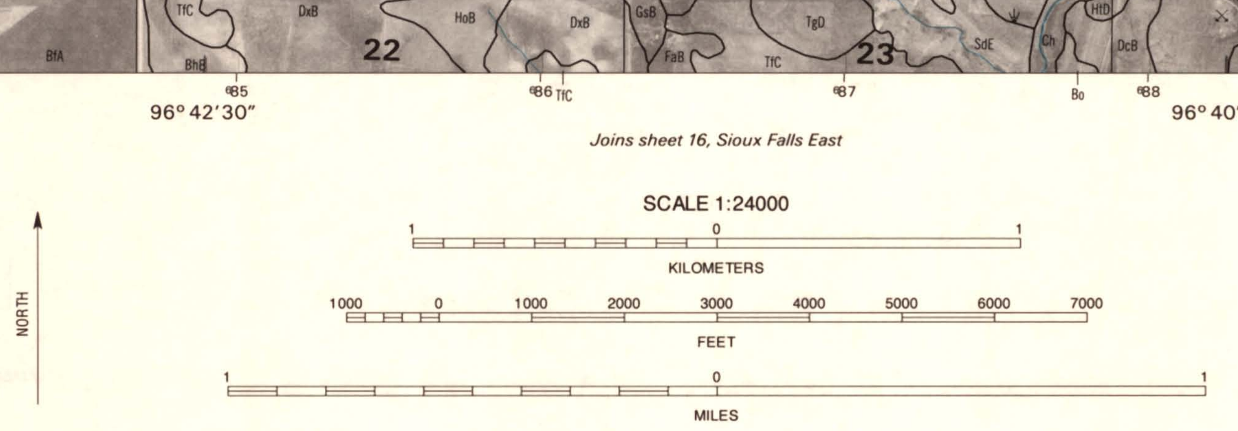

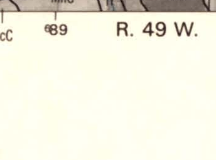

RENNER, SOUTH DAKOTA
7.5 MINUTE SERIES
SHEET NUMBER 10 OF 18

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

MINNEHAHA COUNTY, SOUTH DAKOTA
GARRETSON WEST QUADRANGLE
SHEET NUMBER 11 OF 18

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NORTH

SCALE 1:24000

KILOMETERS

FEET

MILES

QUADRANGLE LOCATION

GARRETSON WEST, SOUTH DAKOTA
7.5 MINUTE SERIES
SHEET NUMBER 11 OF 18

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

MINNEHAHA COUNTY, SOUTH DAKOTA
GARRETSON EAST QUADRANGLE
SHEET NUMBER 12 OF 18

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North American Datum of 1927 (NAD27). Clarke 1866 Spheroid
1000-meter ticks: Universal Transverse Mercator, zone 14.
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NORTH

SCALE 1:24000

KILOMETERS

FEET

MILES

QUADRANGLE LOCATION

GARRETSON EAST, SOUTH DAKOTA
7.5 MINUTE SERIES
SHEET NUMBER 12 OF 18

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

MINNEHAHA COUNTY, SOUTH DAKOTA
GRASS LAKE (OVERSIZE) QUADRANGLE
SHEET NUMBER 13 OF 18

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NORTH

SCALE 1:24000

KILOMETERS

FEET

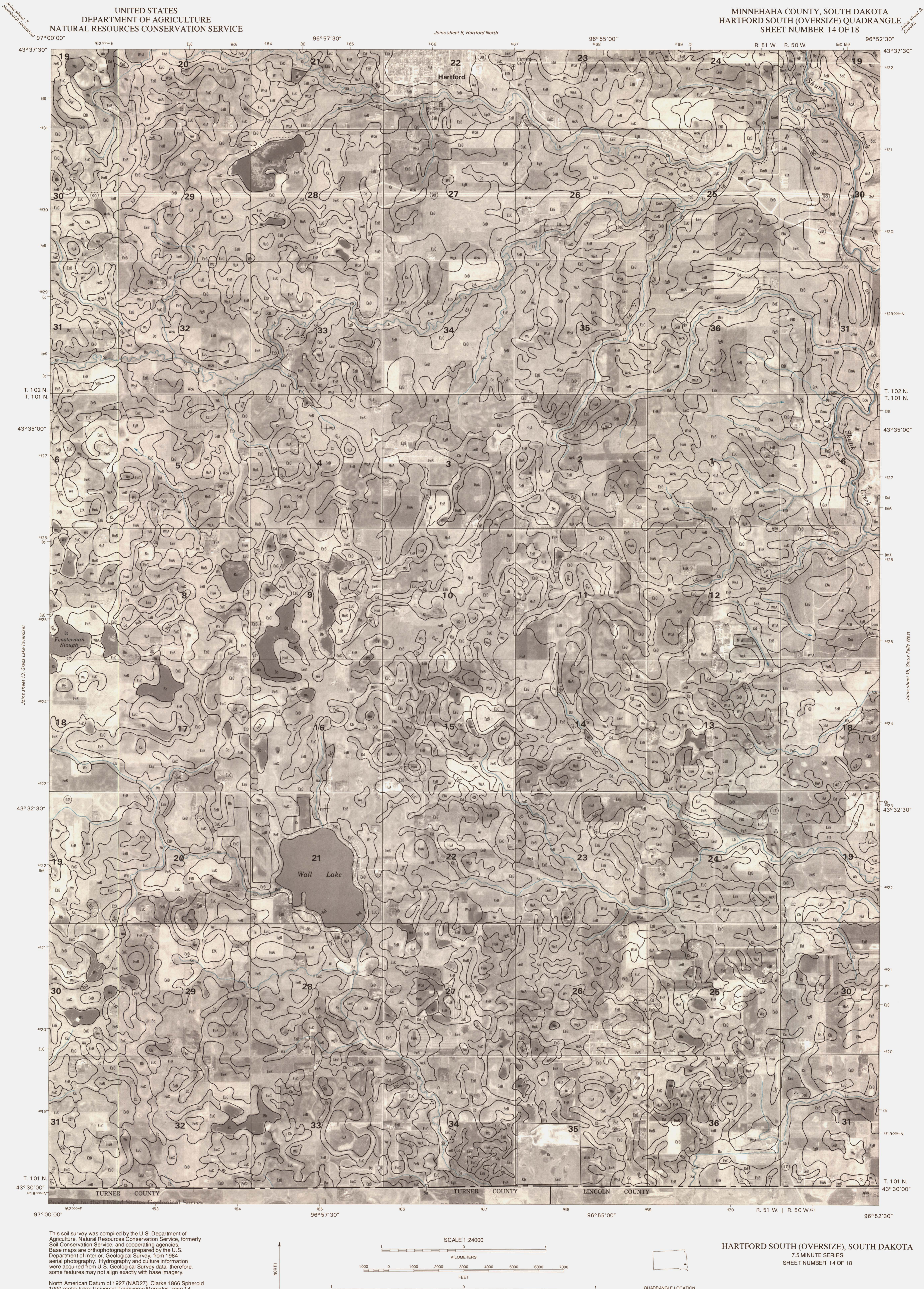
MILES

QUADRANGLE LOCATION

GRASS LAKE (OVERSIZE), SOUTH DAKOTA
7.5 MINUTE SERIES
SHEET NUMBER 13 OF 18

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

MINNEHAHA COUNTY, SOUTH DAKOTA
HARTFORD SOUTH (OVERSIZE) QUADRANGLE
SHEET NUMBER 14 OF 18



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HARTFORD SOUTH (OVERSIZE), SOUTH DAKOTA
7.5 MINUTE SERIES
SHEET NUMBER 14 OF 18

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

MINNEHAHA COUNTY, SOUTH DAKOTA
SIOUX FALLS WEST QUADRANGLE
SHEET NUMBER 15 OF 18

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NORTH

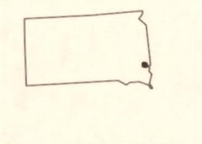
SCALE 1:24000

KILOMETERS

FEET

MILES

MINNEHAHA COUNTY, SOUTH DAKOTA NO. 15

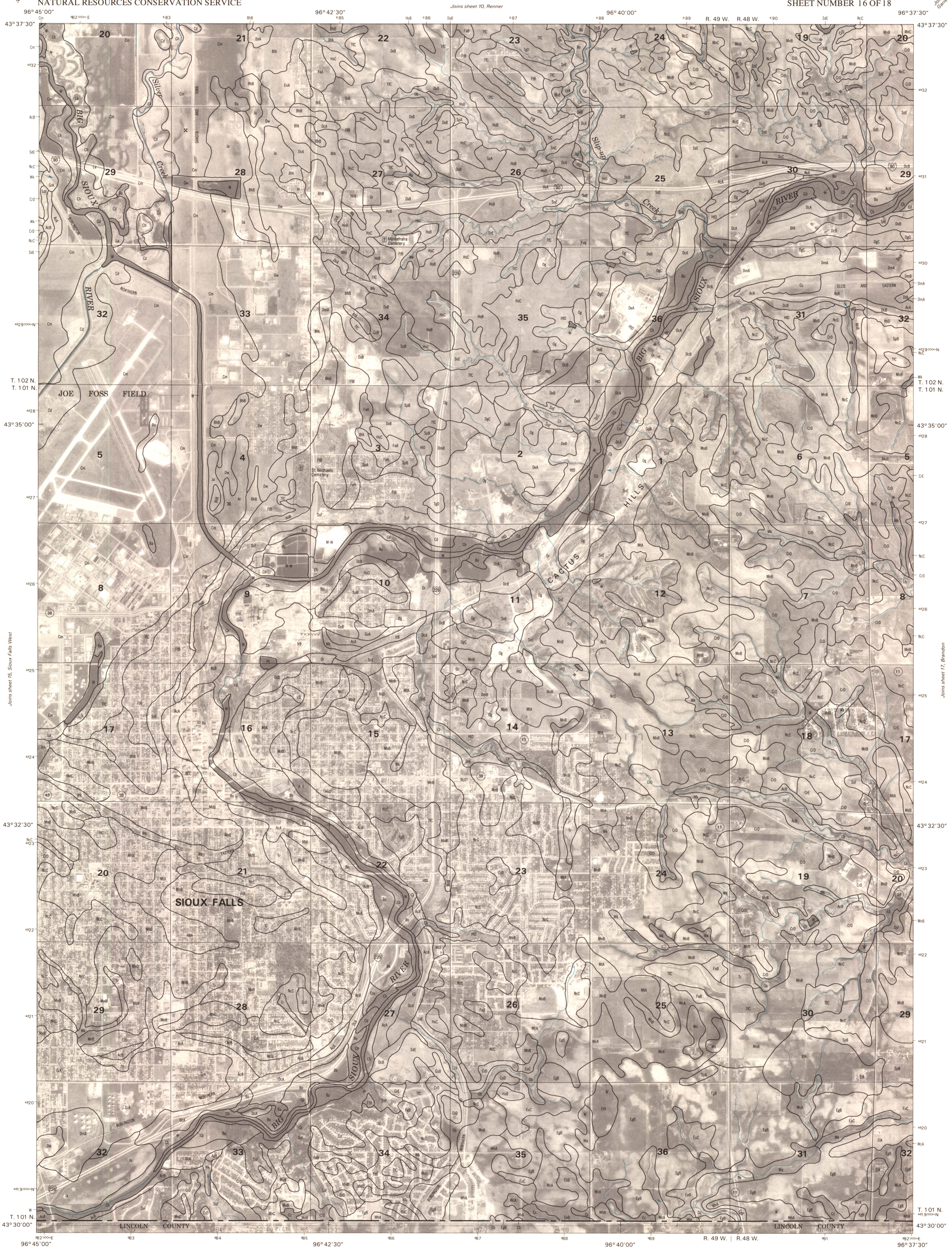


QUADRANGLE LOCATION

SIOUX FALLS WEST, SOUTH DAKOTA
7.5 MINUTE SERIES
SHEET NUMBER 15 OF 18

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

MINNEHAHA COUNTY, SOUTH DAKOTA
SIOUX FALLS EAST QUADRANGLE
SHEET NUMBER 16 OF 18



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SCALE 1:24000

KILOMETERS

FEET

MILES

QUADRANGLE LOCATION

SIOUX FALLS EAST, SOUTH DAKOTA
7.5 MINUTE SERIES
SHEET NUMBER 16 OF 18

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

MINNEHAHA COUNTY, SOUTH DAKOTA
BRANDON QUADRANGLE
SHEET NUMBER 17 OF 18

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NORTH

SCALE 1:24000

KILOMETERS

FEET

MILES

QUADRANGLE LOCATION

BRANDON, SOUTH DAKOTA
7.5 MINUTE SERIES
SHEET NUMBER 17 OF 18

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

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NORTH

SCALE 1:24000

KILOMETERS

FEET

MILES

QUADRANGLE LOCATION

VALLEY SPRINGS, SOUTH DAKOTA
7.5 MINUTE SERIES
SHEET NUMBER 18 OF 18